VOLUME XXXII NUMBER TWO

THE NATIONAL GEOGRAPHIC MAGAZINE

AUGUST, 1917

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The American Black Bear, of which the Brown
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the world entirely devoid of fur overcoats. Their co
open, and in two months they were following the

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ES IN THE WOOD"

rown Bear is a color phase, is not aggressive and will attack
ng. The hungry twins were born in mid-winter and came into
ir coats soon developed, however; in a month their eyes were
g their mother about the great forests of the Yellowstone.

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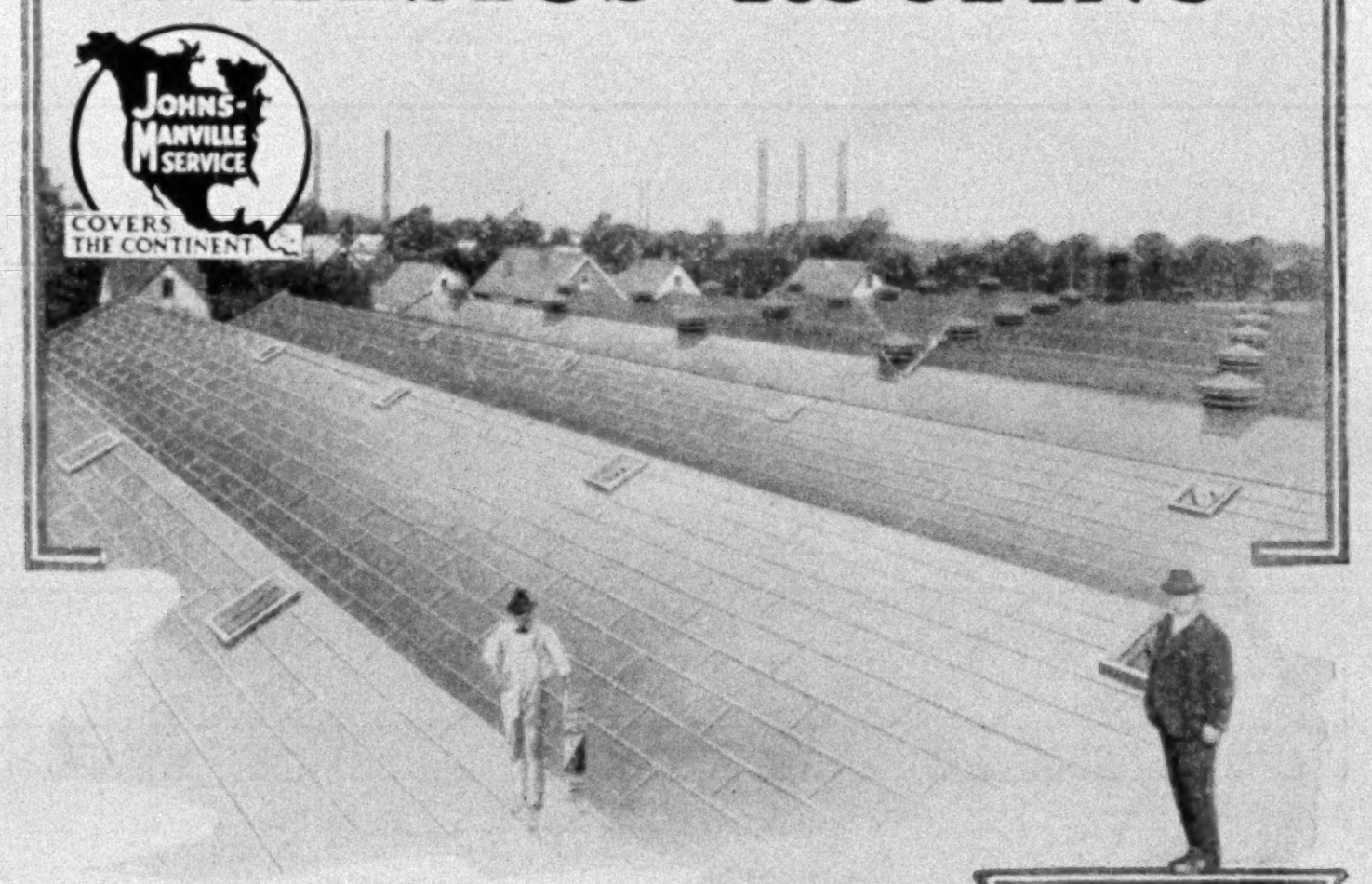

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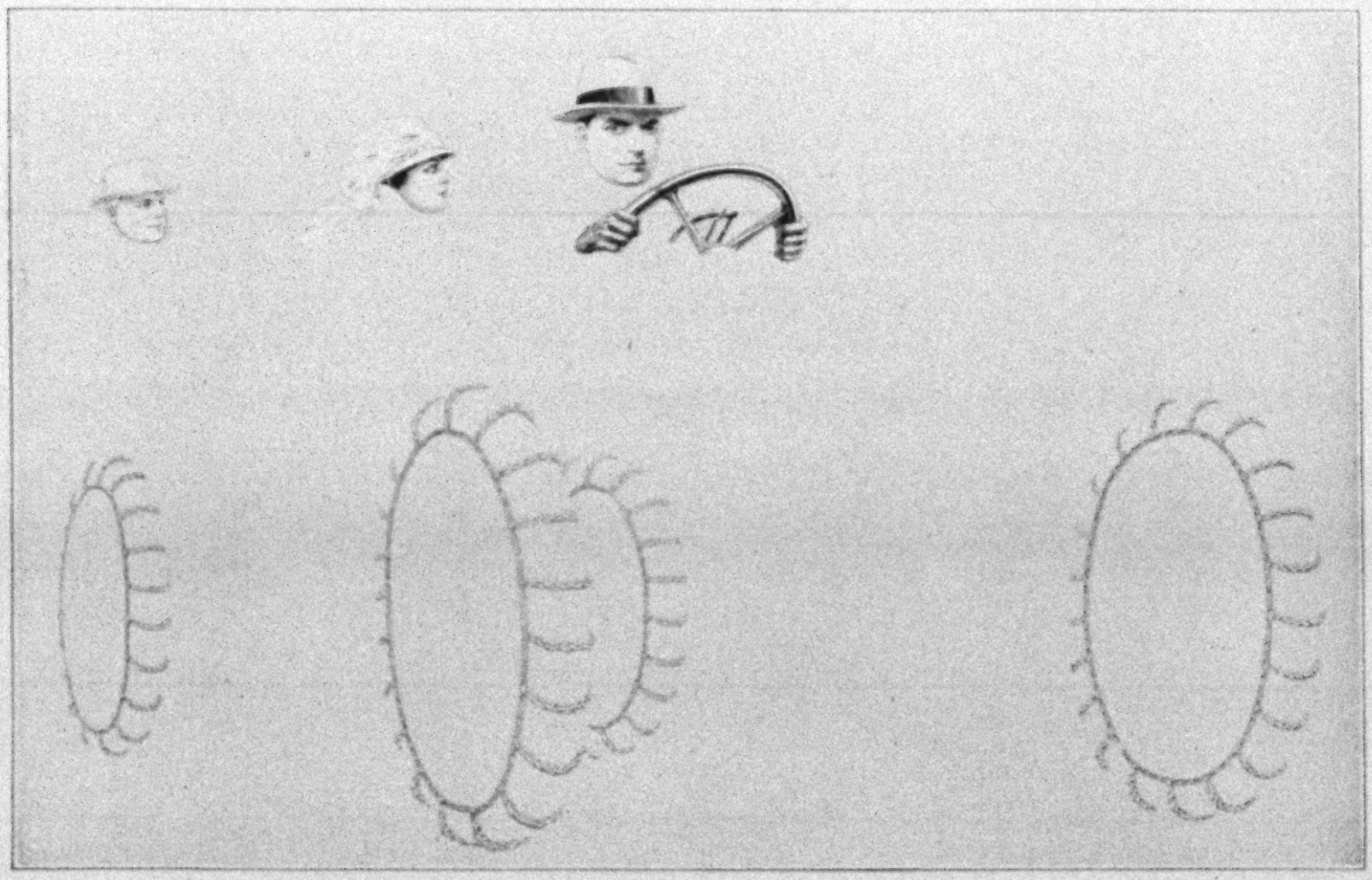

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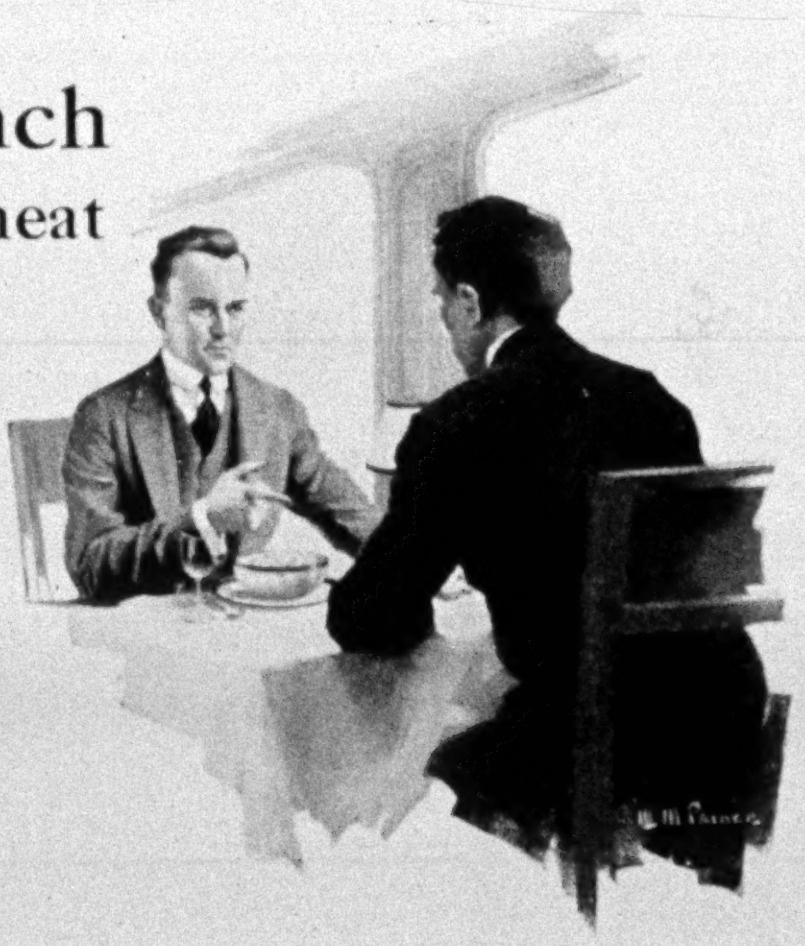
Why I Lunch
on Puffed Wheat



A man on a train, a few weeks ago, told a friend why he lunched on Puffed Wheat. And we think that thousands of men will endorse his view.

He said: "It saves me a dull hour or two. The brain doesn't work well when the stomach is taxed.

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Keep plenty on hand, and all three kinds, for there are no other foods like these.

(1635)

Now is the Time to Use

CONCRETE

War Bulletin No. 2, of the Chamber of Commerce of the United States, says:

> "Iron and steel should be used only when the requirement is unavoidable. Every effort should be made to use wood and concrete in place of steel whenever this can be done, and construction and development work requiring steel should be postponed wherever possible .... cement may be had in quantity for concrete work."

Says Cass Gilbert, the New York architect:

> "There are hundreds of buildings erected in this country every year which could be just as well erected without steel, and in hundreds of others the amount of steel could be greatly reduced. An enormous tonnage could be saved if reinforced concrete, masonry or other material were used. Practically all buildings of moderate height can be erected without the use of large quantities of structural steel. Reinforced concrete or old-fashioned masonry can take its place."

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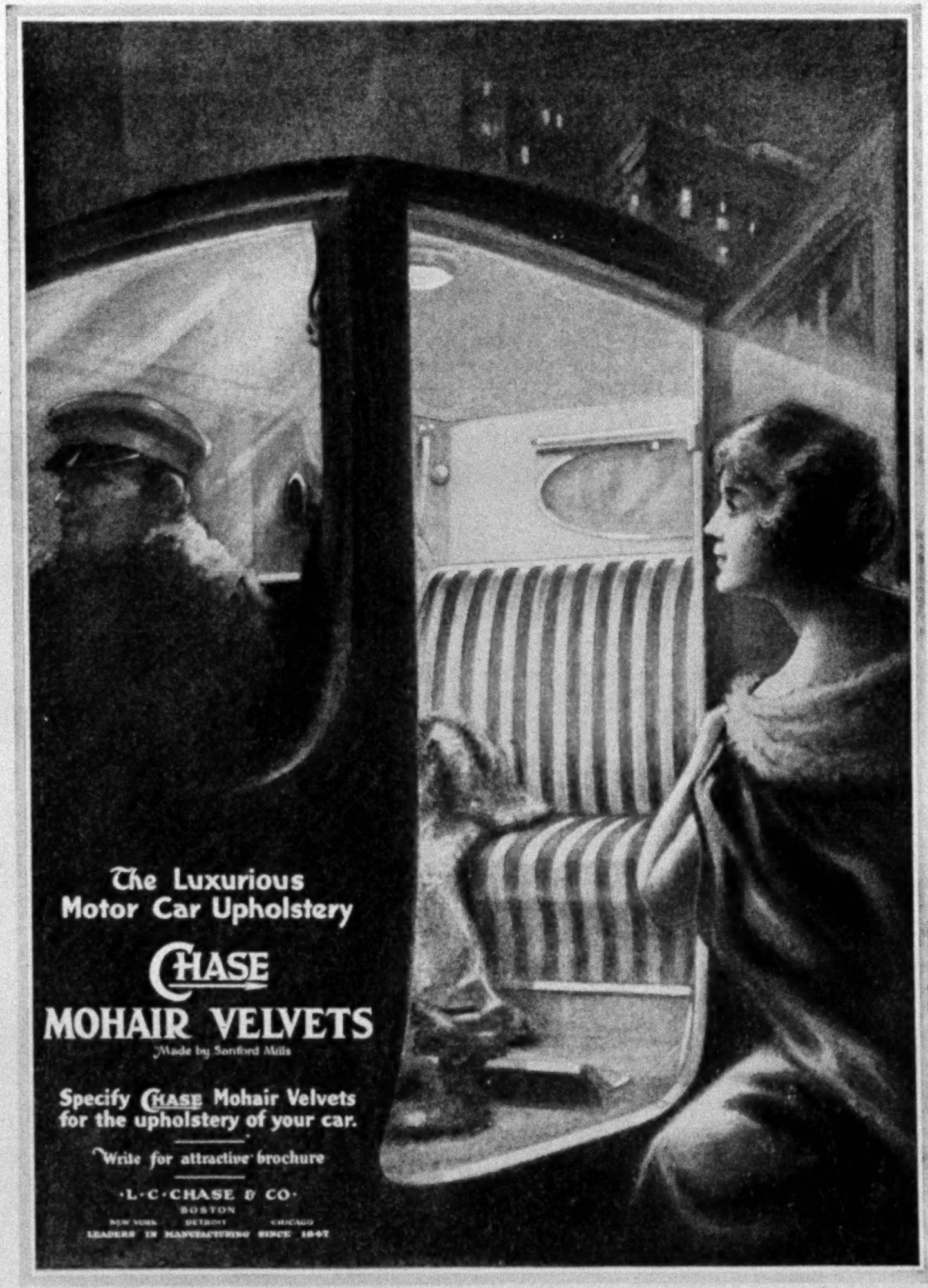
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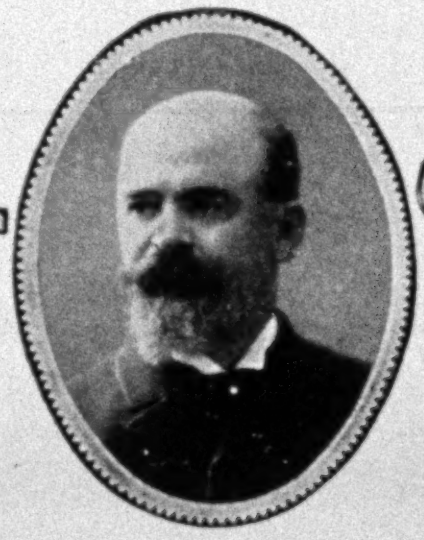

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D. E. Beeman

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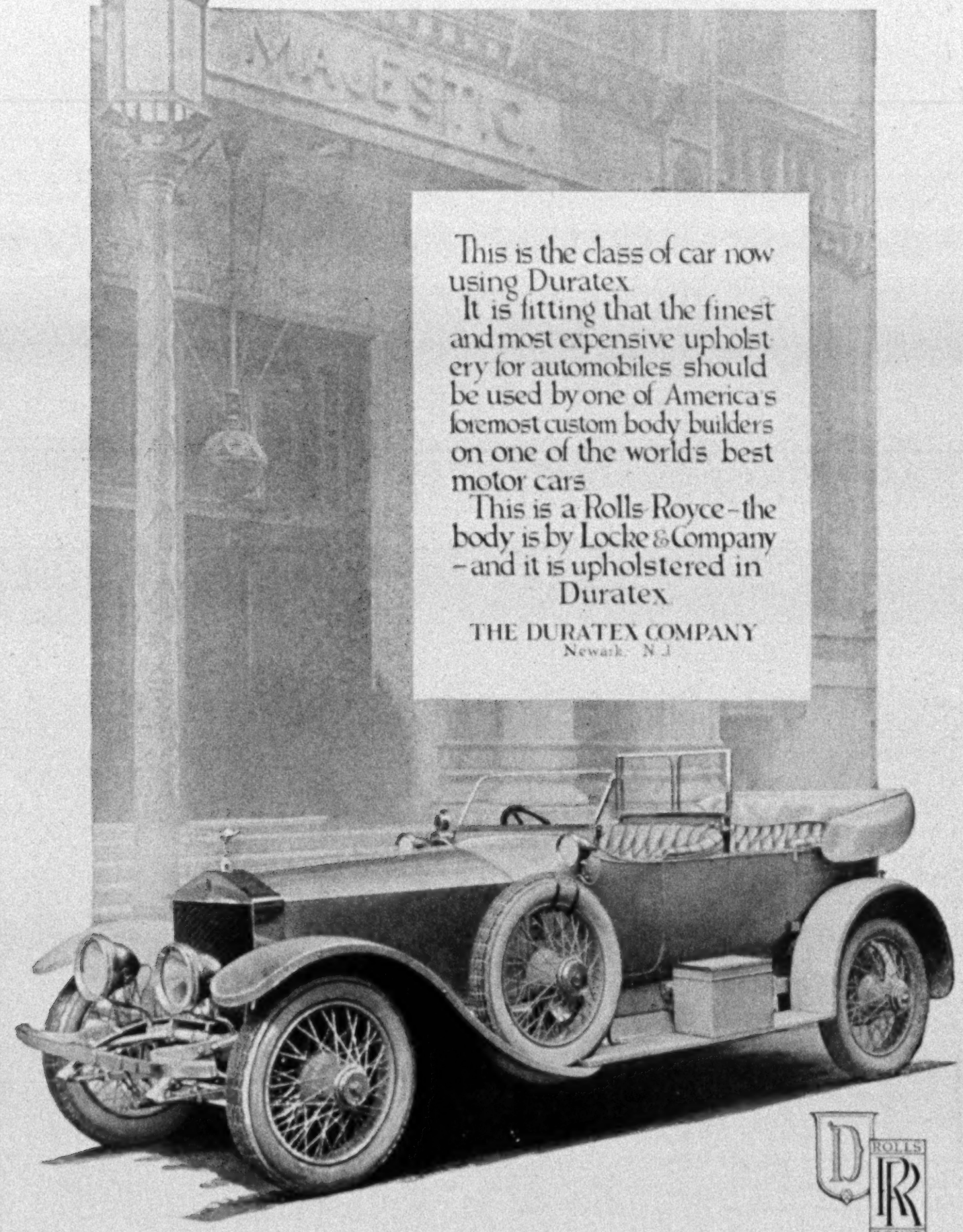

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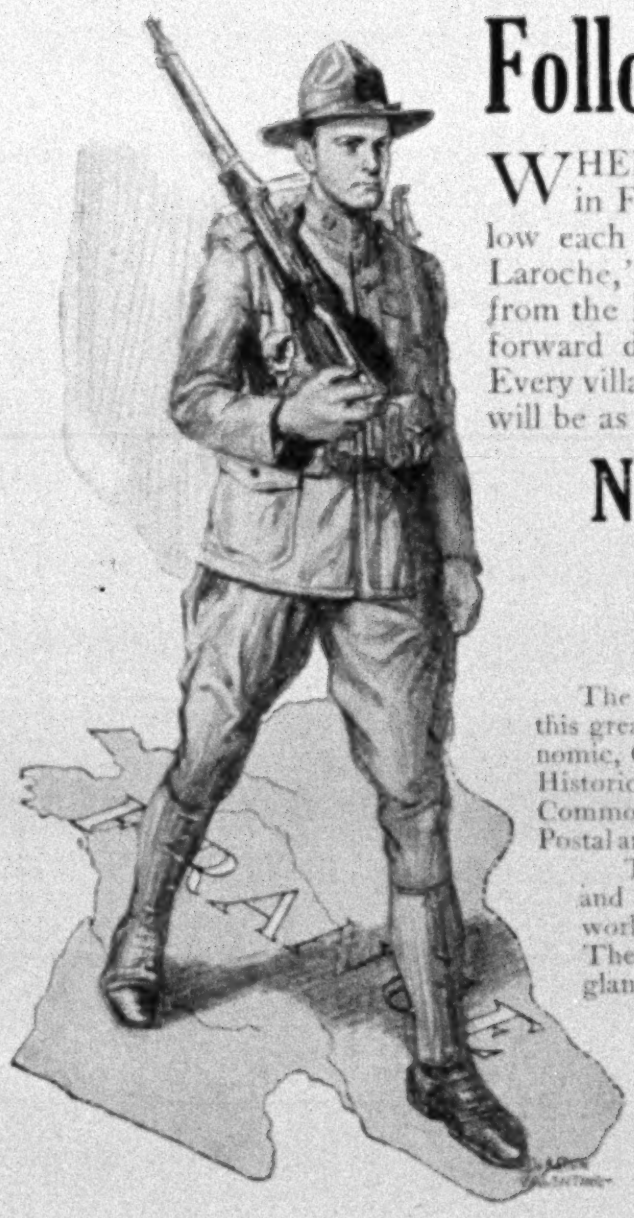

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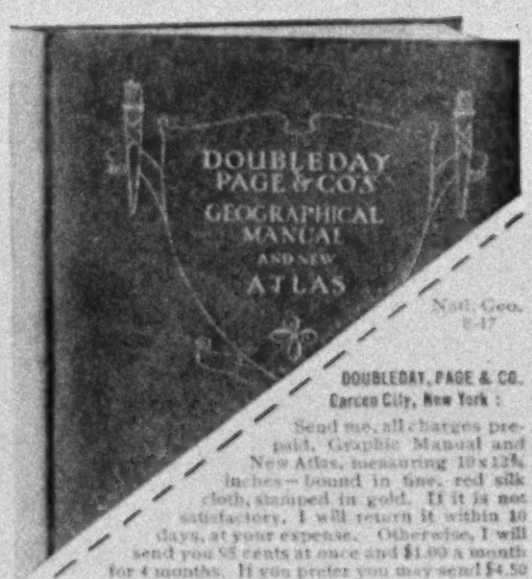

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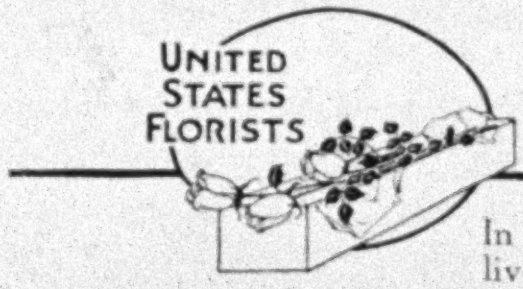

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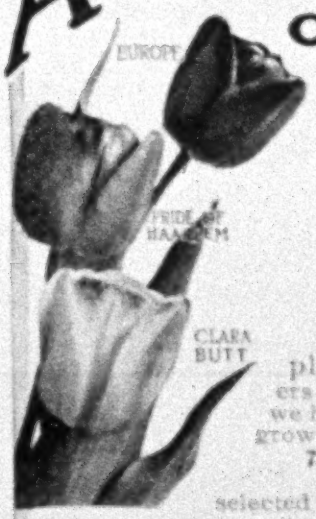

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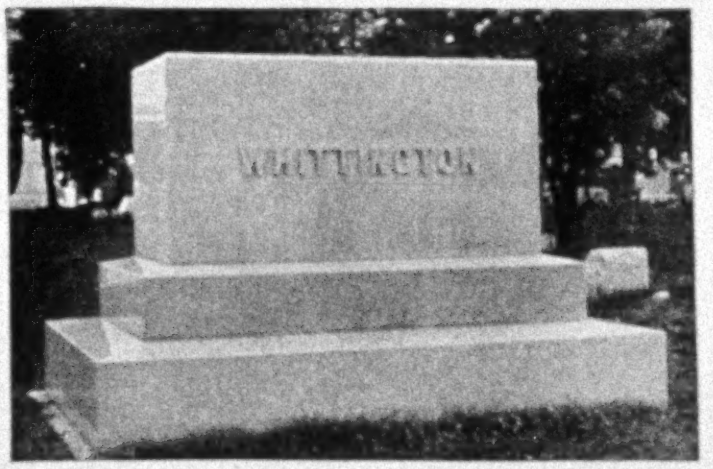

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VOL. XXXII, No. 2 WASHINGTON AUGUST, 1917

THE NATIONAL GEOGRAPHIC MAGAZINE

RUSSIA FROM WITHIN

Her War of Yesterday, Today, and Tomorrow

BY STANLEY WASHBURN

FOR THREE YEARS SPECIAL CORRESPONDENT WITH THE RUSSIAN ARMIES

NOW that the United States of America is committed to the prosecution of the great war to its final conclusion in every respect as deeply as are the other Allies, it is of paramount importance that the American people have as full and complete an understanding as possible of all of the factors in the war which make for final victory.

Russia with her great front, which, including Roumania, extends from the Baltic to the Black Sea, and which today is detaining somewhere between two and three million enemy troops, is such an important part of the whole theater of operations that what is going on in Russia becomes of the most vital interest to all of the Allies, and perhaps to the United States more than any of the others.

In the final analysis the defeat and elimination of Russia would mean that ultimately the vacancy made by the absence of her troops on the eastern front would have to be filled by substituting American troops on the French or some other front where pressure might be brought against the forces of the Central Powers.

It would be folly to minimize the dangers of the present situation in Europe; but equally is it criminal and harmful for us to magnify these dangers by the unintelligent acceptance by press and people of this country and of the countries of the Allies of rumors of disaster and stories of a pessimistic nature about Russia and her future.

It is, of course, stupid at present to attempt to prophesy what is going to happen in Russia; but it is legitimate to trace briefly what has happened in the past in Russia, and from the precedence of her history and the knowledge of the present in some measure gauge an estimate of the future.

UNFAIR TO JUDGE RUSSIA BY DAY-TO-DAY EVENTS

In all war situations, both at the front and in the political centers, one must exercise the greatest possible restraint in making any day-to-day judgments. So vast are the political and military changes that occur almost overnight in all of the warring countries that one must guard against any conclusions save those based on fundamental elements gathered over long periods and attuned to the perspective of the war as a whole and to what we know of the detailed history of the armies and people engaged therein, not for the last few months, but for the entire length of the war to date. This perspective is more necessary in judging Russia than in forming opinions of any

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COMRADES IN A STRANGE LAND

General Hugh L. Scott, Chief of Staff of the United States Army and a member of the American Mission to Russia, surrounded by privates of the Russian Army. In the new European republic the campaign service hat is unknown; officers and enlisted men alike wear military caps. During the visit of the Mission the orderlies of the American officers were instructed to wear caps also, in order to establish their military status.

of the other nations. It is as unfair and misleading to judge Russia and the Russian people and their part in the war from what is going on from day to day in the new republic as it would be to judge the mentality of an individual who, having undergone a long and serious operation, is just coming out from ether.

Before we can fairly judge the Russians at all we must wipe from our minds the daily news, and with impartial vision carefully weigh the knowledge and experience which we have of Russia in character, not only in the past three years, but from her history as a whole. We must then, as far as we can, understand the Russian point of view of today; try to realize what the situation is from this people's standpoint and what capacity they have of acting other than they are now doing. Then, knowing as we do certain definite factors, we can judge for ourselves what we may anticipate from Russia in the future.

In an article in the GEOGRAPHIC MAGAZINE for April, I made some reference to Russia in the war and her contribution. In order that we may fully appreciate what she has already done and the extent to which the Russian people have already, irrespective of the future, earned the gratitude of all of the Allies, it seems worth while briefly to recapitulate her achievements.

WHEN THE FATE OF EUROPE HUNG IN THE BALANCE

In August, 1914, when Paris was in danger, the Russians almost overnight threw an army into East Prussia, which moved with such success that Berlin was flooded with refugees fleeing before the Cossacks. At a moment when the fate of Europe seemed to hang on the operations in the West, the German high command detached six army corps (240,000 men) from the armies on the western front and dispatched them against the

Russians. Ten days later the French and English checked the Germans on the Marne. The Germans sent to East Prussia inflicted a defeat on Russia which cost the latter 165,000 men. But Paris was saved. Later in the year, when the Germans were driving on Calais and England, another Russian sortie through Poland was launched. Between November 1 and December 15 nearly sixteen German army corps were detached from other operations and sent against Russia. Again there were retirements in the East, but again the Allies profited in the West, for the Germans did not take Calais and England was not threatened from that quarter.

Operations against Russia occupied the Germans from December, 1914, to April, 1915. The troops forming these contingents represented forces which might otherwise have been attacking in the West. In the spring of 1915 Russian advances in Bukovina and Galicia so threatened the stability of Austria and Hungary that the Germans were obliged to devote their entire summer's campaign to reëstablishing the Austrian morale and driving the Russians back. To do this required between 35 and 40 German army corps, not to speak of depot troops to the extent of perhaps half a million sent to replace losses.

The world looked upon 1915 as a year of Russian disasters; but too many superficial observers forget that during all that summer the surplus which represents the difference between the capacity to resist and the capacity to attack was operating all that time against the Russian army. The result was that England and France had almost one whole year in which to beat their plows into swords and their untrained manhood into soldiers. The British and French armies and various offensives of 1916 and 1917 are the direct outcome of Russia's contributions of the preceding year. It is clear, then, that the Russian sacrifices of 1915 have been almost as potent in their effects on the world situation as was the battle of the Marne significant in the campaign of 1914.

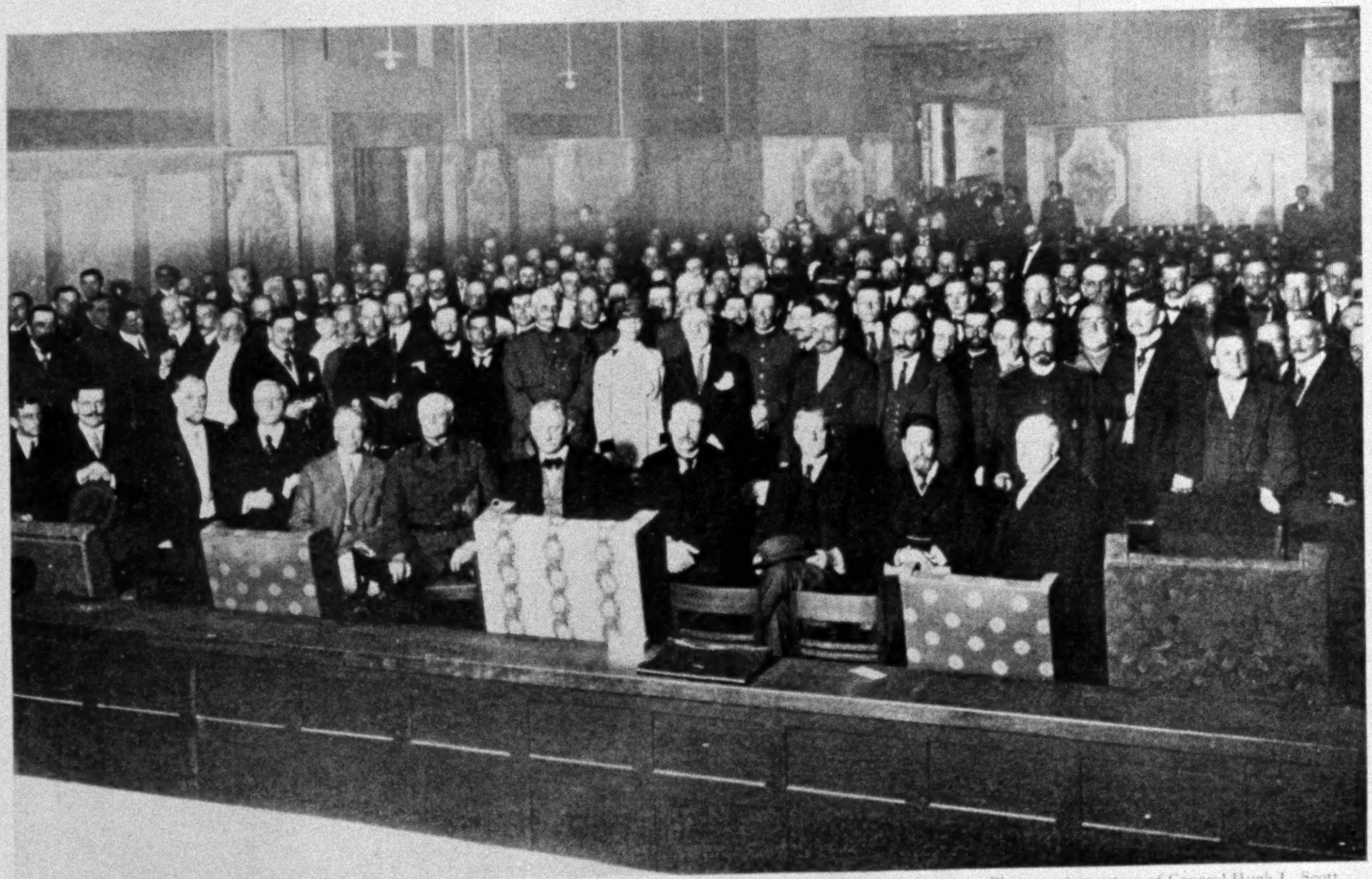
The Russian offensive of 1916, in which Brusilloff captured nearly half a million enemy prisoners and 500 guns, again destroyed the initiative of the enemy and relieved pressure on the Italian front. The contribution of Roumania, disastrous as it has proved to that unfortunate little country, diverted to the south, at a time when the Germans would otherwise have had them available for attacking England or France, no less and perhaps more than 30 German divisions.

RUSSIA HAS EARNED WESTERN ALLIES' UNDYING GRATITUDE

Let the fair-minded student carefully weigh all these facts and ask himself whether or not Russia has in the first three years earned the undying gratitude of her partners in the West. Before he presumes to sit in judgment on Russia of today let him consider what this contribution has cost the East during the last three years. It is difficult to estimate exactly, but it is perhaps not far from the facts to say that there have been called up in the past three years in Russia between 12,000,000 and 14,000,000 men. Probably 7,000,000 can be charged off as permanently ineffective through death, wounds, disease, and lost as prisoners to the enemy. If we allow three members in the family of each, directly affected, we have 21,000,000 civilians upon whom the burden of war has fallen with crushing effect. Add to this number the 15,000,000 refugees who have been driven into the heart of Russia by German invasions, and include the persons who have sustained serious losses consequent to the war. The total comes to the stupendous aggregate of 43,000,000, a number almost equal to the population of the United Kingdom or, to bring it nearer home, more than one-third the population of the United States. Such is the price that Russia has so bravely paid to date in her effort to coöperate with the Allies!

OUR MENTAL YARDSTICK

America has not yet begun to shed her blood in the cause. Perhaps it would be fair for Americans to review in their minds what Russia has done and suffered before they in any way judge the Russian situation of today. Russia has made



Photograph courtesy of General Hugh L. Scott

MEMBERS OF THE AMERICAN MISSION TO RUSSIA AND THE BOARD OF TRADE OF PETROGRAD

During the visit of the Mission to the new republic numerous meetings and receptions similar to this were held, and it was at such gatherings that the Americans made known to their Russian allies the reasons which actuated the older republic to enter the struggle against autocracy. In the front row Major General Scott, Ambassador Francis, and Elihu Root, chairman of the Mission, are easily recognized.

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REPRESENTATIVES OF TWO FREE AND SOVEREIGN PEOPLES

From left to right: M. I. Terestchenko, Russian Minister of Foreign Affairs; General Alexis Brusiloff, at the time Commander-in-Chief of the Russian Army; Elihu Root, head of the American Mission to Russia; Major General Hugh L. Scott, and Brigadier General R. E. L. Michie, of the American Army.

Courtesy of Illustrated London News

"FAREWELL! A LONG FAREWELL TO ALL MY GREATNESS!"

Closely guarded, Nicholas Romanoff, the ex-Emperor of Russia, is seen seated on the stump of a tree felled by his own hands. Before his removal to Siberia the dethroned monarch, surrounded by his wife and children, resided comfortably, under military observation, in the palace of Tsarskoe Selo. A Paris correspondent writes: "At meals with his children, or some specially invited guest, Nicholas is always in pleasant humor and never makes the slightest allusion to his downfall." To one of his associates in captivity, however, he is said to have observed, "I am hardly less free now than formerly, for have I not been a prisoner all my life?"

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FUR AND FEATHERS: MASCOTS OF THE HEROIC RUSSIAN WOMEN'S "BATTALION OF DEATH"

The advent of the woman soldier fighting for liberty in the armies of New Russia has been one of the most inspiring developments of the war since the overthrow of the Romanoff dynasty. These young women patriots have already set their brothers in arms a magnificent example in loyalty, obedience to military authority, and bravery under fire.

these sacrifices and is, as a matter of fact, still fighting, while America has not yet begun. It is my purely personal point of view that the Russians have by their contribution saved Europe, even if they fight no more, though there is reason to believe that they will continue, in spite of losses and political confusion, to battle until the end.

We have, however, reached a point where the Allies can win without Russia. Her staying in the war represents a saving in time and a saving of human life and treasure rather than any difference in the final issue. The collapse of Russia in 1915 or 1916 might have lost the war; but that moment has, in my judgment, passed. Let us, therefore, recognize the services of Russia in the years agone and appreciate them before we consider the situation of the present.

In order to realize what the Russians are now going through politically, it is necessary to understand the average point of view of their 180,000,000 odd population. It must be understood that of these millions the vast majority are of the peasant class and can neither read nor write. At the beginning of the conflict they knew little or nothing of the issues of the war, but came to the colors in the slow, unemotional, and negative way that they always go to war. It is foolish to say that the war was popular in Russia. No war is ever really popular in any country.

"NOT WILLING TO GO, YET THEY WENT WILLINGLY"

Perhaps the attitude of the average Russian is illustrated by the remark a peasant made to me when asked if many had gone from his village to the war. "Nearly all of military age," he replied. "And were they glad to go to the war?" I asked him. "Who would go to war

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RUSSIAN WOMEN SOLDIERS AT WORK

Although they have recently acquired skill in firing a rifle and attacking with a bayonet, these Russian girls of the "Battalion of Death" have not forgotten how to manipulate pots and pans.

gladly?" he asked mildly. "Well, then," I queried, "were they willing to go?"

For a time he hesitated and then said, "They were not willing to go, yet they went willingly," which exactly represents the attitude of the Russians toward the war at its beginning. For the first six months they were fighting a battle for the Tsar between his government and that of the Kaiser. After that the war shifted to a combat between the German army and the Russian army, for the peasant of the East took grave exception to the Teutonic method of conducting warfare.

Day by day and month by month, as wounded went home to tell of German frightfulness, and as refugees by the million circulated through the villages of Russia, the feeling against the Germans became more and more bitter and the desire in the hearts of the peasants to see them beaten at all costs became more and more profound. It has taken perhaps two years for this feeling to develop among the peasants of Russia, and it is, I sincerely believe, the feeling throughout the nation, or it certainly was prior to the revolution, before the crafty German propaganda came to befog the issue in the untutored peasant mind.

During these early days of the war an efficient government on the part of the old régime would have made the power

of the Tsar, as well as his personal popularity, unshakable. If ever a man missed the chance of being called "The Great," it is the unfortunate Nicholas.

But while the wish of the people to continue the war was steadily growing up throughout Russia, the government itself was sowing the seeds of its own undoing. Every one has been amazed at the suddenness of the collapse of the old régime; but such a collapse was logical and inevitable sooner or later. The Emperor's government was undermined by the complete incompetence of its administration. In time of peace it might have gone on in the same hit-and-miss way for years and the peasants would have taken but a meager interest, as few would have felt directly the results of mismanagement in any greater measure than normally.

Wide-spread revolutions in Russia have been difficult, because it has been impossible to reach all of the people at the same time on the same issue. The war, however, did reach all the people at the same time. After a year or two nearly every individual in Russia had been directly or indirectly touched in some way. The soldiers at the front knew that they had no ammunition and few rifles in 1915, and they knew that this shortage was due to the bad management of the government. The people knew that the railroads were not operating properly, and that, as a result, many of them were obliged to go without food and fuel during the winter months. This, too, was charged to the government of the Tsar. The scandals in regard to the monk Rasputin became common property, and by the fall of 1916 all of Russia, save the bureaucracy, favored members of the autocracy, and the pro-Germans, was of the fixed conviction that the people's troubles were due to this incompetence.

THE MOST REMARKABLE REVOLUTION IN HISTORY

Step by step this universal opinion had developed in Russia until it had become practically unanimous in cities, in the country, and in the army. There was no wide-spread cry for revolution, no demand for a new Tsar, nor any national demand for the cessation of the war. All the people wanted was a decent government, which would continue the war efficiently and in the interim enable them to live somehow or other.

There has never been such a remarkable revolution in history. It has not represented plot and intrigue and ambitions of individuals. It represented merely the united desire of 180,000,000 people to carry on a war in which they believed, with the minimum of misery and with the maximum of competence. Through stupidity in some quarters and intrigue and treachery in others, the Tsar steadfastly refused to make the concessions required to conduct the war and permit the people to live. Pressure in the Duma became acute. The Emperor ordered it dissolved. It refused to dissolve. Troops were called out to restore order in Petrograd, where bread riots had started a chaotic situation. The troops, being but boys three or four months in uniform, were of the people in opinion and declined to shoot. Authority ceased, and the Emperor, having nothing behind him, accepted the ultimatum that he abdicate.

Practically, without any serious convulsion, the Empire disappeared. I suppose one must call it revolution, but it came so easily that it is hard to believe it such. The change came like a ripe apple falling from a tree. A few days of killing and hunting down policemen who were loyal to the government marked the end of any serious disorders in Petrograd. The rest of Russia quietly accepted what Petrograd had done. The old order had disappeared overnight. Now let us consider what remained.

When the bread riots started there was apparently no party or class in Russia that was planning for the immediate overthrow of the Tsar; all that any one wanted was a more liberal and efficient government. Even the leaders of the Duma did not dream that the change could be brought about without any effective resistance on the part of the old régime. It all came in a day or two, and the Provisional Government and its committee of twelve suddenly found itself in control of the destinies of the former Empire.

Photograph by C. S. Stilwell

A BREAD LINE IN PETROGRAD

Russia's food shortage difficulties during the last nine months have been brought about not by the failure of wheat crops or a shortage in the grain markets, but by disorganized transportation facilities. It was an army of hungry revolutionists which overthrew the Romanoff dynasty.

THE RUSSIAN PEASANT'S FUNDAMENTAL CONCEPT OF THE STATE

Now, in all of the centuries past there have been just two ideas in Russia which, in the minds of the peasants, have stood for the State. They were the Tsar and the Church, of which the Emperor was the head. The psychology of the Russian of the lower class is extremely simple. It is necessary for the Russian to see in order to appreciate anything. The men who created and built up the Greek Orthodox Church in Russia no doubt clearly realized this phase of the Slav mind, and hence that religion has been founded on the worship of God through the pictures of Christ, the Virgin Mary, and the saints. The direct conception of an abstract idea seems hardly to exist in Russia. Hence the Church provides the almost innumerable list of saints whose pictures, or ikons, are the mediums through which the peasant mind conceives the idea of his God.

As travelers in Russia will recall, there is in almost every public room some ikon, and all over Russia the mind of the people has in this way been focused. In an analogous way, the idea of the State was expressed to the people in the person of the Tsar and in the institution of the Church. Pictures of the Emperor were as common as the ikons and exercised almost the same function toward the government as the religious pictures did toward the Church. It is clear, then, that the Emperor and the Greek Church represented the keystones of the arch of government in Russia.

In a day, and with the country entirely unprepared in thought for any such change, the Emperor ceased to exist, and the Church as a political influence was eliminated. As far as the millions of common people in Russia were concerned, the State as a whole practically ceased to exist. They had never thought of the national idea save in terms of Church and Tsar, and with both removed their minds lapsed into immediate solution where any tangible conception of the State was for the time being difficult, if not impossible.

It is obvious that any government to be strong and effective over any length of time must represent the combined strength of the individuals that compose it. In a week, Russia, as far as the opinion of the bulk of her people was con-

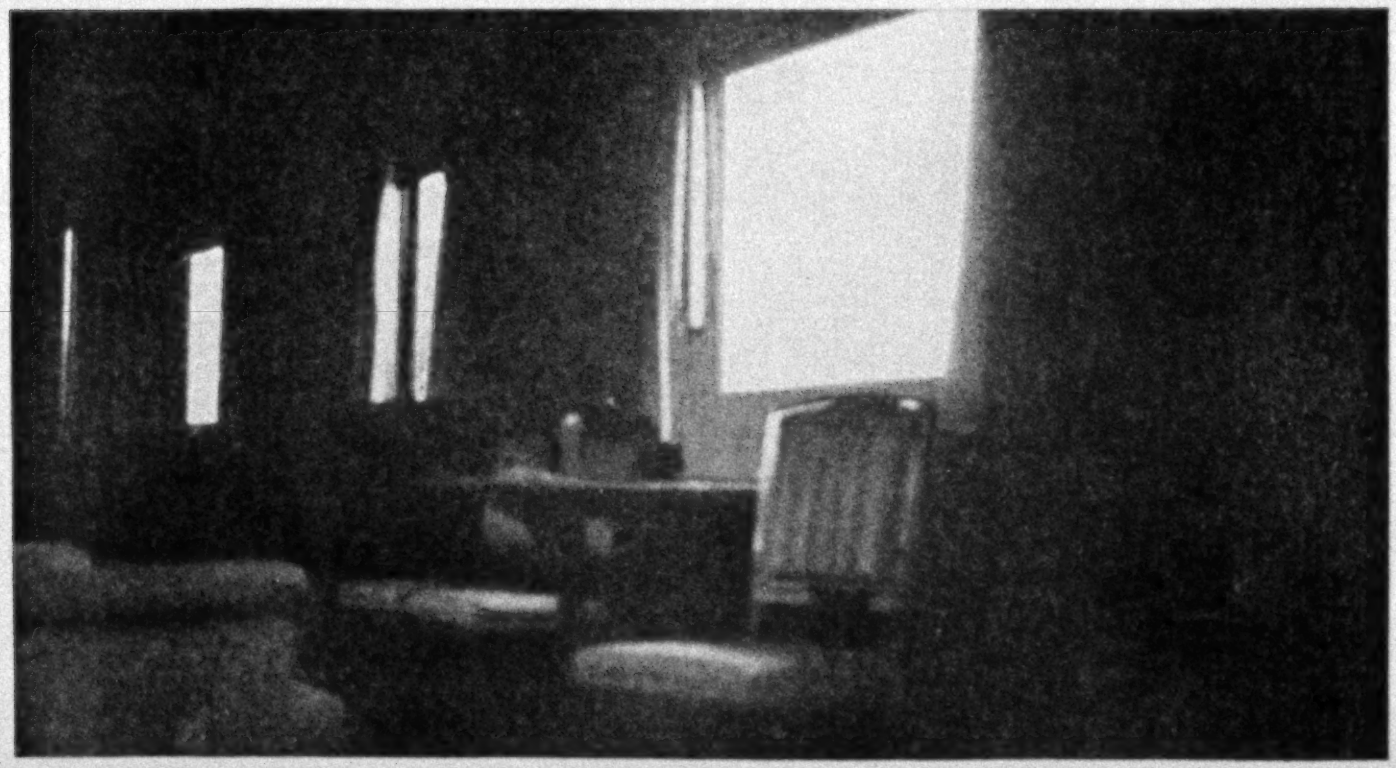


TABLE UPON WHICH NICHOLAS II SIGNED HIS ABDICATION

In the years to come this bit of furniture in the imperial Russian railway coach will be of as great historic interest as the table shown to visitors at Fontainebleau, upon which Napoleon signed his abdication in favor of his son, the infant King of Rome, 103 years ago, and then (so the guide explains to the credulous), in a fit of rage, threw the pen upon the table, leaving the great blotch of ink on the top.

cerned, was in a state of complete chaos. The masses did not in the least realize the significance of what had taken place, nor were they able to express themselves or their genius through the new medium which was suddenly established.

The committee of the Duma, which took charge of the Provisional Government, faced the most difficult problem which any group of men has ever encountered. It was their task to keep the war going while the minds and opinions of the people were readjusting themselves to an entirely new standard as to what the State actually was. Had there been no war under way, there is not the slightest doubt but that the problems would have been worked out without friction or disorders of any sort, for the people left to themselves would have gradually developed new and working institutions to fit their own needs.

GERMANS QUICK TO PROFIT BY BREAKDOWN OF THE OLD ORDER

But the people were not left to themselves. The breakdown of the old order in Russia gave to the Germans the chance which they were quick to seize for their own profit.

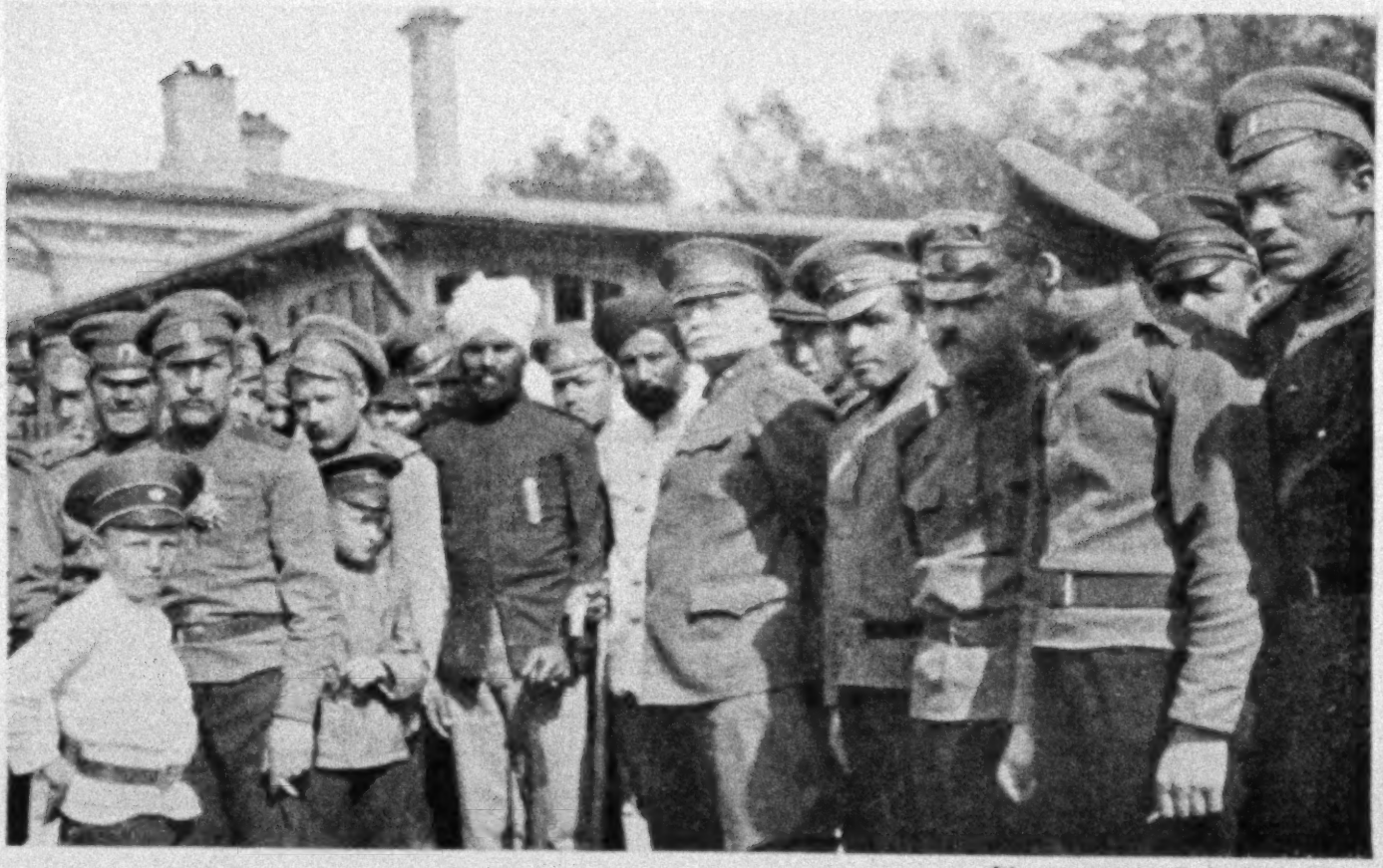
In the first days of confusion thousands of German agents and spies swarmed through Russia, worked their way through the lines and began the hugest program of propaganda which the world has ever seen. It is difficult to say what the Germans have spent in Russia; but the figure which is accepted as being accurate in well-informed circles in Petrograd approximates 48,000,000 roubles since the revolution.

Almost at once parties were formed to attack the new government and to interfere in every way with the conduct of the war. Agitators from Germany openly preached peace at any price and circulated every form of malicious and insidious fallacy which could undermine the strength of the government.

There grew up in a somewhat obscure fashion in Petrograd the body known as the Council of Workingmen's and Soldiers' Delegates, which took upon itself the uninvited task of acting as critic of the new government. I have never heard by what authority this body exists; but as nearly as one can discover it grew from a small and informal body of men of all classes, anxious to help in the revolution, to a committee of above 2,500 in

Photograph by C. S. Stilwell

THE RUSSIAN WOMEN'S "BATTALION OF DEATH" RETURNING FROM SPECIAL SERVICES IN ST. ISAAC'S CATHEDRAL, WHERE THEY CONSECRATED THEIR LIVES TO THE CAUSE OF FREE RUSSIA



Photograph by C. S. Stilwell

GENERAL SCOTT, TWO SIKHS, AND A GROUP OF RUSSIAN SOLDIERS AT AN ASIATIC WAY-STATION ON THE TRANS-SIBERIAN RAILWAY

The character and the stamina of the American officer and of the Russian soldier are familiar to the world, but neither is the simple Sikh of the Punjab to be despised as a fighting entity. Inspired by a militant religion, he is acknowledged to be the finest soldier of the East. Hardy, brave, and obedient to discipline, he is said to be steady in victory and unyielding to the death in defeat. Note the large military caps worn by the Russian school-boys in the group.

number, which acquired such power and influence that it came to dominate the original committee of the Duma, the latter having adjourned and exerting no influence whatever on the situation. The Soldiers' and Workingmen's Delegates forced reorganizations in the government and at every crisis have directed the changes in the Ministry.

The great committee at once split into many groups, the most objectionable being that party of extreme radicals calling themselves the Maximalists or, as the Russians say, "Bolshevik." It is impossible and unfair to brand these people as German agents, but it is a safe assertion to state that they have always played the German game. From them have emanated all of the crazy ideas which have reduced Russia to confusion and destroyed the morale of the army. The Maximalists would have division of the lands, immediate cessation of the war, friendly relations with Germany, entire destruction of government, and in fact almost every form of radical idea that anywhere or at any time has preyed upon the civilized world.

These few at once created a split among the Socialists, the sounder ones going in support of the new government, while the old element continued to preach doctrines which, in any other time, would have been branded as sedition. This group, which has been making most of the trouble, has been reduced in strength until it now comprises probably less than 15 per cent of the whole body and can be discounted save for the damage already done.

KERENSKY THE POINT OF FOCUS ON WHICH TO RALLY

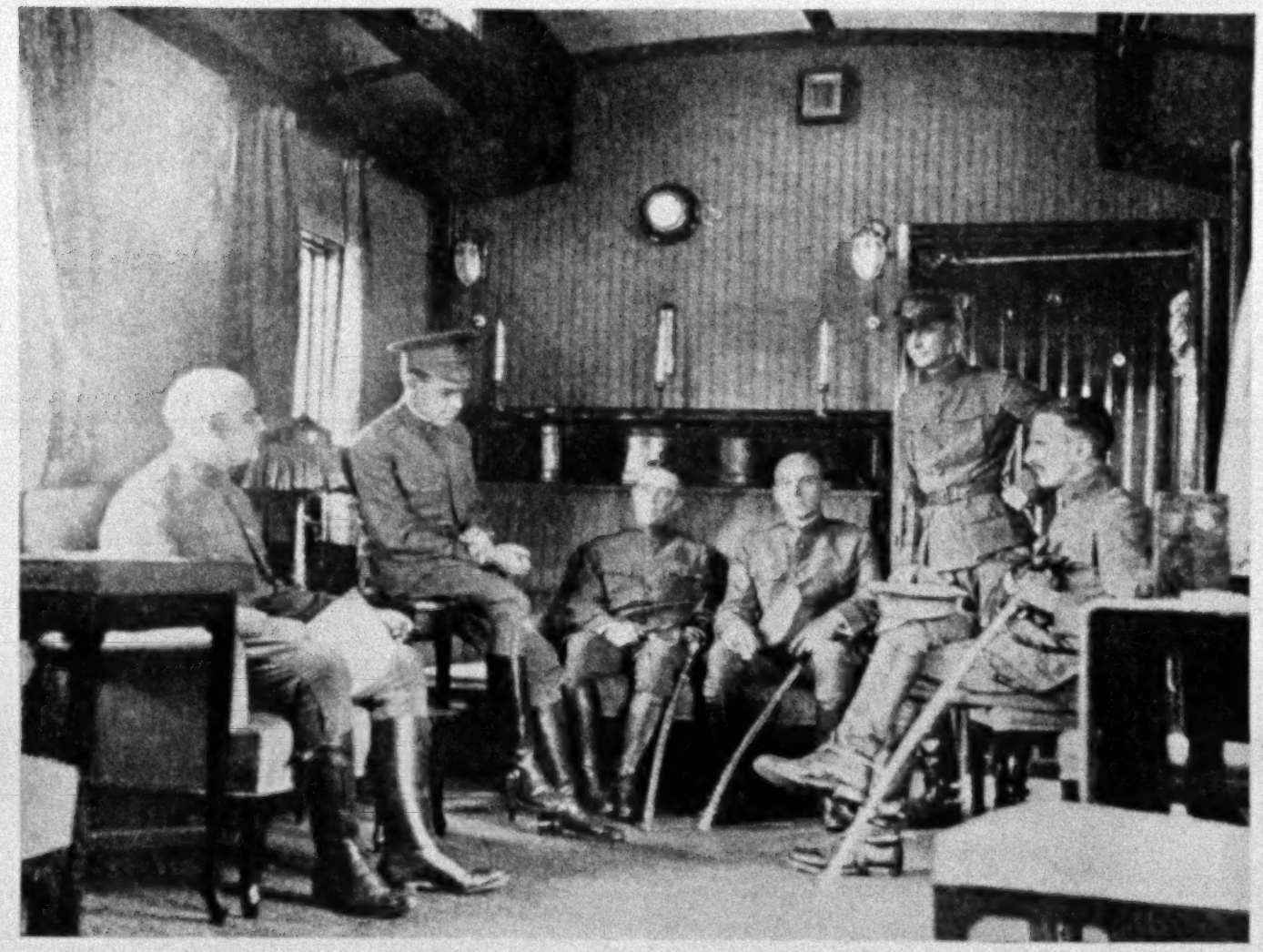
The coming to the fore of Kerensky has given the government a point of focus on which to rally, and it has now become a question as to whether or not the army at the front can maintain itself in being, as a whole, while the men at the rear with Kerensky organize the govern-

CHINESE OFFICIALS AT HARBIN WHO WELCOMED TO ASIATIC SOIL THE AMERICAN MISSION ON ITS WAY TO PETROGRAD

Photographs by C. S. Stilwell

BURYAT PRINCES ASSEMBLED TO GREET THE AMERICAN MISSION UPON ITS ARRIVAL IN MANCHURIA

A Mongolian race, residing in the Baikal Lake region, the Buryats long opposed the advent of the Russians; but in the closing years of the seventeenth century they finally submitted to their European overlords and are now considered among the most peaceful of Russian peoples.



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MILITARY MEMBERS OF THE AMERICAN MISSION TO RUSSIA IN THE APARTMENTS OF THE FORMER TSAR ON THE IMPERIAL TRAIN IN WHICH THEY TRAVELED FROM VLADIVOSTOK TO PETROGRAD

Seated at the left, beside the table on which Emperor Nicholas II signed his abdication of the Russian throne, is Brigadier General (then Colonel) William V. Judson. To his left is Major Stanley Washburn, for three years special correspondent with the Russian armies. The two officers seated on the divan are Major R. Le J. Parker and Major M. C. Kerth, American military observers detailed to Russia. Lieutenant Colonel Bentley Mott is standing and Captain E. Francis Riggs, also a military observer, is seated at the extreme right. Note the numerous handsome furnishings of the car. Among its permanent fixtures are twenty-seven thermometers, sixteen barometers, and eight clocks of elaborate design and beautiful workmanship.

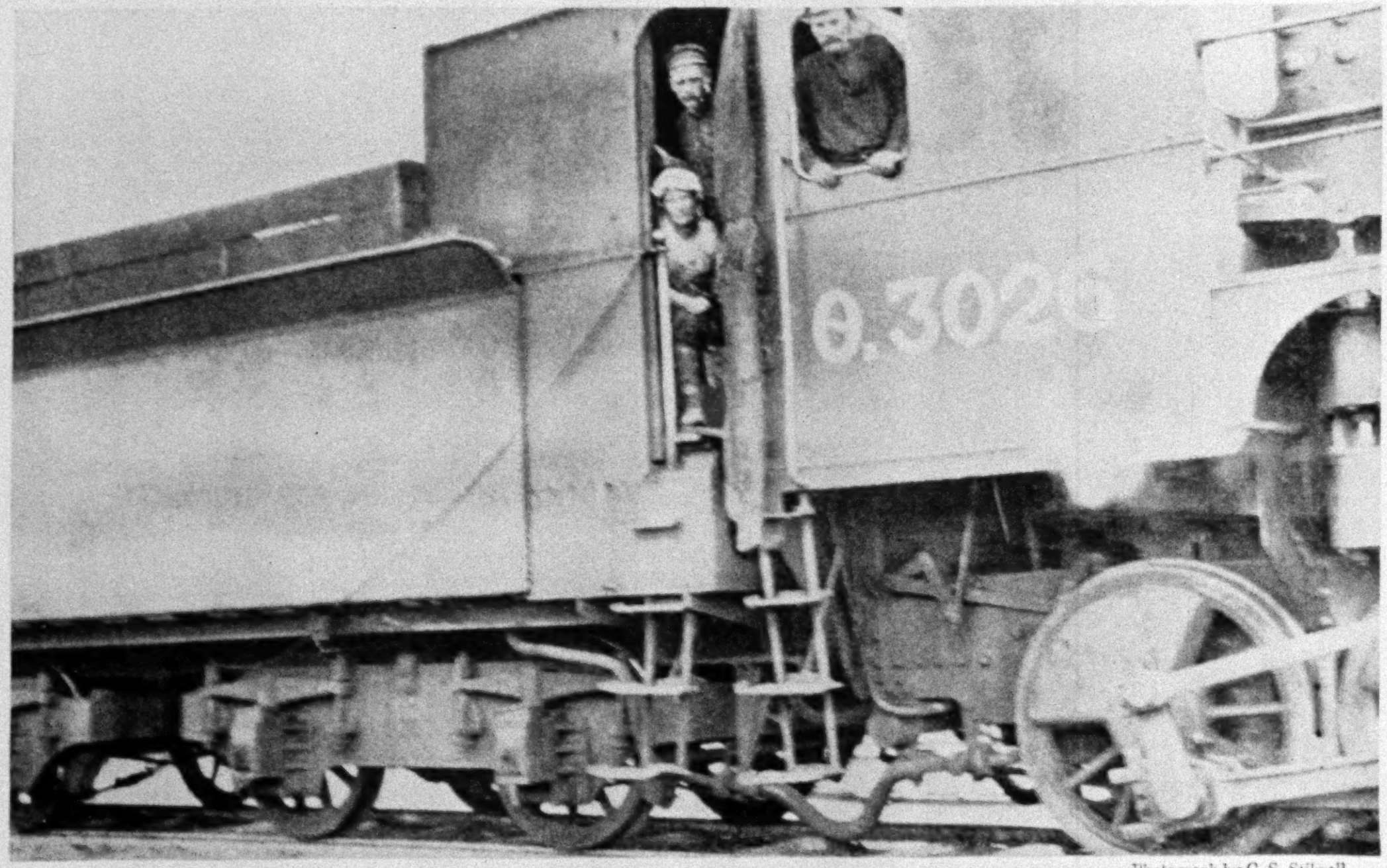
ment and restore internal conditions to the normal.

Russia in the past few months can be likened to a crab changing its shell. The crab is a perfectly healthy one, and given the opportunity unmolested it will surely and certainly grow a new and impervious shell. But in the interim the crab is in a delicate position. It is now the task of the army and the men rallying around Kerensky to keep the crab protected until the new shell has grown, when all danger will have passed in Russia.

Persons returning from Russia express great optimism as to the outcome for a sound and permanent democracy, and their judgment is perhaps based on the study of what the Russians have not done in this period of confusion rather than what they have done.

The situation in Russia since March has been one of the most remarkable in the world's history, and if any one has in the past felt apprehension of the Russian character as a world menace, the lesson of the last few months should forever dissipate it. Here we find an immense country suddenly told that there is no longer an Emperor, and that they are free.

Now, freedom and liberty to the Russian peasants are taken literally. To the



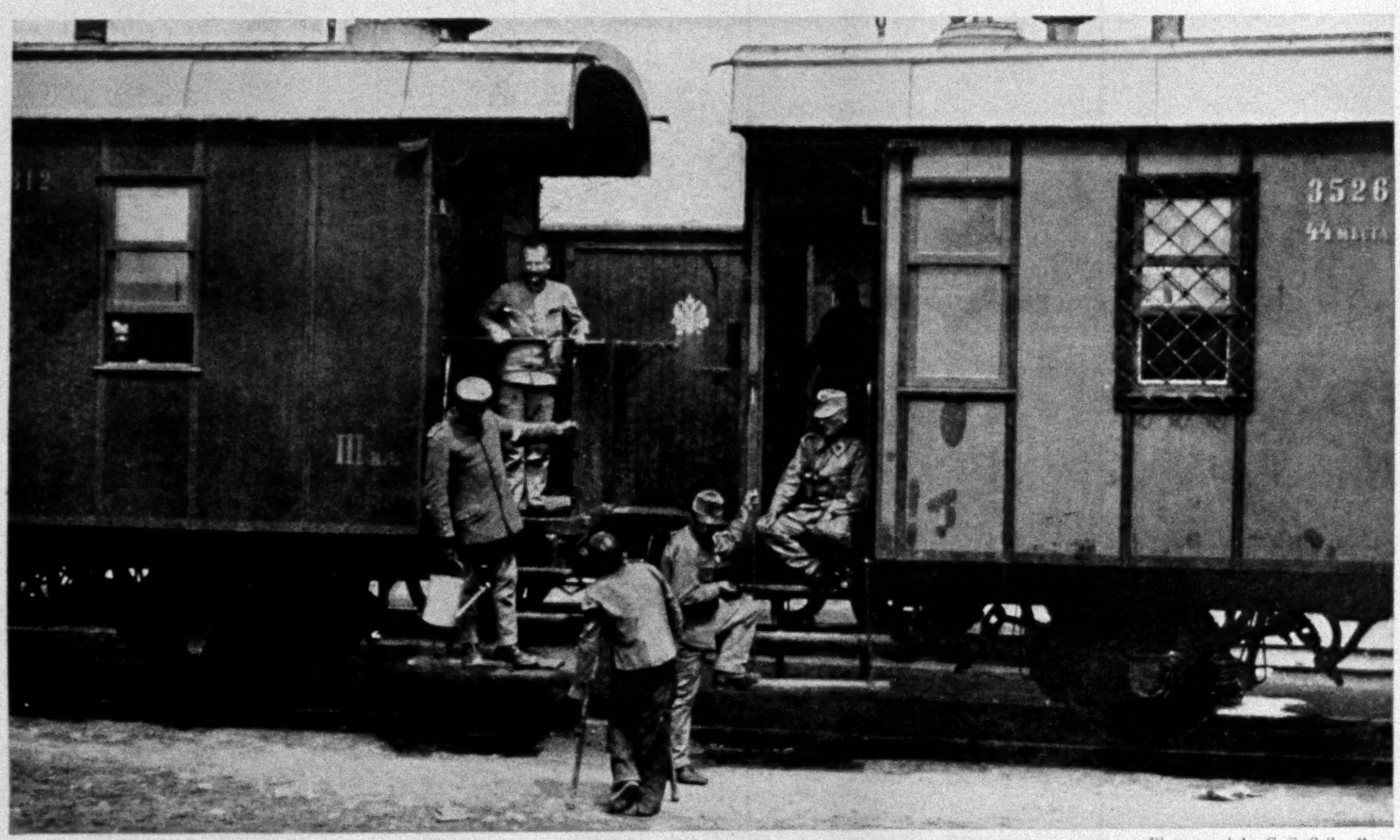
Photograph by C. S. Stilwell

A RUSSIAN WOMAN SERVING AS AN ASSISTANT FIREMAN ON THE TRANS-SIBERIAN RAILWAY

Not only in the "Battalion of Death" is the Russian woman proving her devotion to her country and to the cause of liberty, but in many industrial activities is she assuming her share of the burden of keeping the armies supplied with munitions and provisions. By serving on the tender of a trans-Siberian locomotive this woman is proving herself a worthy disciple of her French and English sisters-in-war, who have taken the places of men needed in the trenches.

Photograph by C. S. Stilwell

SENATOR ROOT ADDRESSING SOLDIERS AT PERM

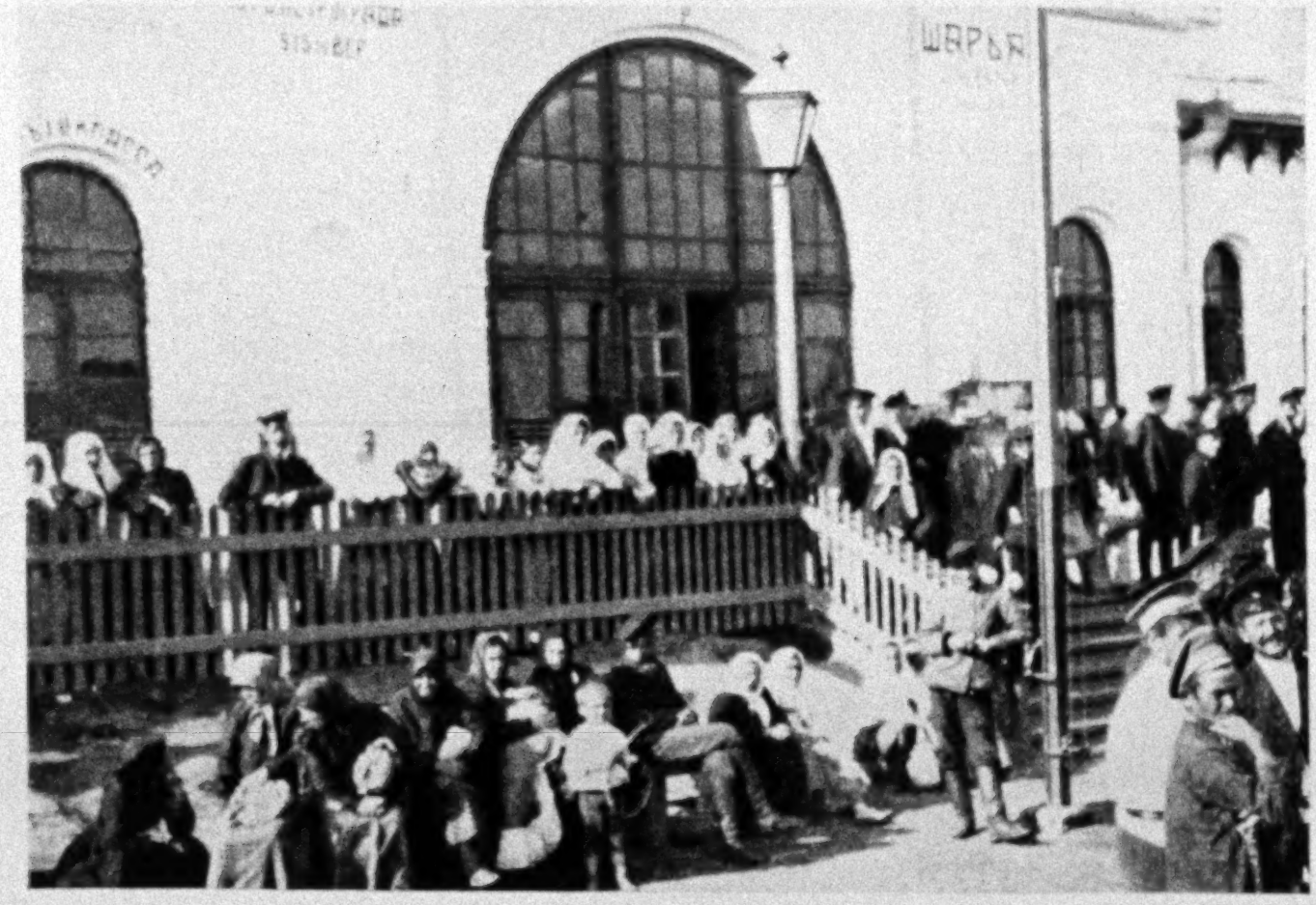


Photograph by C. S. Stilwell

GERMAN PRISONERS AT WORK ON TRANS-SIBERIAN RAILWAY

Photograph by C. S. Stilwell

STATION SCENE ON TRANS-SIBERIAN RAILWAY: PEASANT WOMEN SELLING FOOD



Photograph by C. S. Stilwell

AFTERNOON STATION SCENE: VYATKA

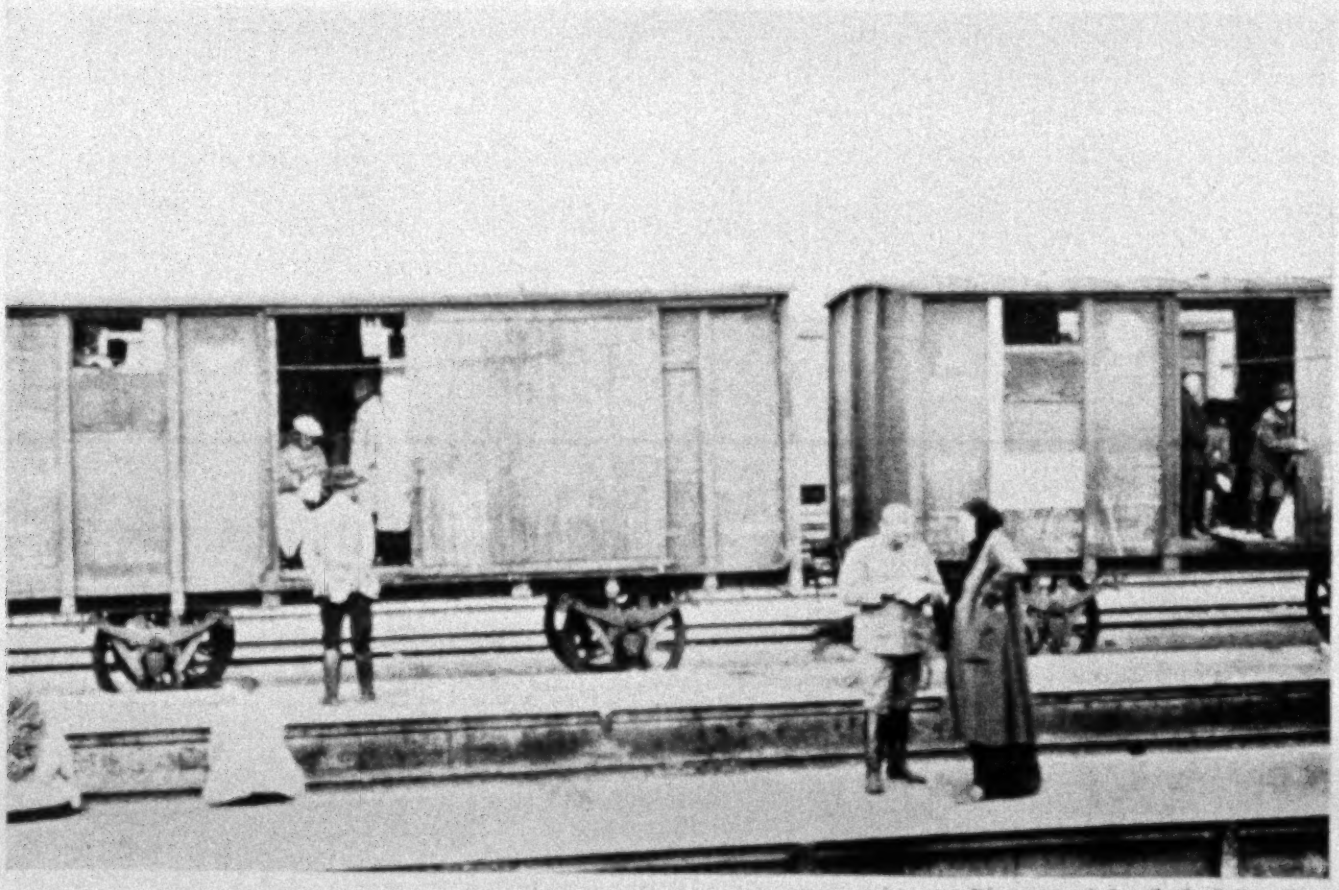
moujik, or peasant soldier, "freedom" means individual liberty in the most widely accepted sense rather than political liberty. It means to him that he is free to do exactly what he likes, to come and go as, when, and where he pleases; it means that the railroads, the street-cars, and the public property are free. Hence, the soldiers at once began to bask in this new freedom, and for months railroads and street-cars were black with troops in all parts of Russia, riding everywhere because they had, as they believed, the right to ride. The police vanished in a day, and citizens who were designated by bands on their arms and who were entirely unarmed became the guardians of the peace and order of the country.

SPEECHMAKING HAS BECOME THE NATIONAL PASTIME

Now mark what happened. Practically nothing. Liberty and freedom did not to the Russians represent any form of disorder or lawlessness whatever, and it is a safe venture to state that in European Russia there has been less crime and disorder than before the war.

The entire population has taken the summer off to celebrate their new liberty and to talk it over. Speech-making has become the national pastime. During the summer, when the nights have been short and one can read a paper at midnight, the discussion of public affairs has gone on day and night in the main streets of Petrograd. In a perfectly good-natured way the situation is discussed from every angle. The extraordinary part of the speech-making and the crowds is that all views are equally applauded. A pro-German orator will be greeted with loud cheers, while the man who mounts the barrel and denounces him will get an even greater ovation. One at last comes to the realization that the applause is not for sentiments expressed, but for the fact that there now exists the opportunity for free expression of opinion.

All summer long the Germans with their propaganda have been attacking this extremely vague opinion of the man in the street, using every method within their power to force him into the making of an independent peace. He is told that there are to be no annexations and no indemnities, and that further sacrifices



Photograph by C. S. Stilwell

TRAVEL ON THE TRANS-SIBERIAN RAILWAY

can yield him no profit. He is assured that the Germans are and always have been his real friends, and that they stand ready and willing to finance him and help him rebuild Russia. A thousand subtle measures are used to persuade him that England made the war and that he has fought it, and that the food crises in Russia are due to the British blockade. Again he is told that the Tsar made the war, and now that the Tsar is gone, there is no reason for him to continue in it.

From every angle and in every way his slow mind has been attacked by the Teuton influences to make the worse appear the better cause; and in spite of it all, and notwithstanding the losses and disasters and miseries of the past three years, the Russians have not made peace, their armies are still fighting, and their people, though confused, are still showing the inclination to hold on until the end.

At the front, the German influence was even more pernicious than it was at the base, for here the soldiers were allowed to fraternize with the enemy. Literature was prepared for them in Germany, printed in Russian, and passed between the lines. They were told that they had won their liberty and their freedom, and that the policy of their government was "no annexations and no indemnities," and then they were asked why they were fighting, a question difficult for the simple mind to answer.

Again the kindly Germans warned them that the lands of Russia were about to be distributed, and if they stayed in their trenches they would miss this distribution entirely, while the stay-at-homes got all the prizes; and still enough Russians remained in the trenches to offer a front 1,200 miles in length to the line of the enemy forces in the East.

THE GERMAN POLITICAL DRIVE A FAILURE

In the meantime, through the unwise orders relaxing discipline in the army, the morale of the Russian troops began slowly to deteriorate, and by this decrease in efficiency the position at the front became a serious one. Yet throughout there has been a background of solid common sense, for in spite of all that has happened, and all that the Germans have done in the way of propaganda, they have not achieved their purpose in their political drive on the Russian people any more than they achieved their purpose in their military drive of 1915.

The wonder is not that Russia failed

ELIHU ROOT LEAVING A CHURCH IN THE FAMOUS KREMLIN OF MOSCOW

The peculiar religious pictures on each side of the doorway are mural decorations characteristic of many of the sacred buildings of the Slavic Empire

Photograph by Paul Thompson

SOLDIERS OF THE REVOLUTION BRINGING IN A CAPTURED POLICEMAN OF THE OLD RÉGIME: PETROGRAD

"Practically without any serious convulsion the empire disappeared. The change came like a ripe apple falling from a tree. A few days of killing and hunting down policemen who were loyal to the government marked the end of any serious disorders in Petrograd. The rest of Russia quietly accepted what Petrograd had done."

© Paul Thompson

MEN AND WOMEN OF PETROGRAD WHO, WITHOUT RESORTING IN ANY MARKED DEGREE TO THE UNRESTRAINED VIOLENCE OF MOB RULE, OVERTHREW A CENTURIES-OLD DYNASTY AND BECAME FREE

Soldiers and civilians assembled before the Duma eagerly, but in orderly fashion, waiting to learn what would happen next in the course of the most amazing revolution the world has ever seen.

Photograph by C. S. Stilwell

HOLIDAY SCENE AT VYATKA

© Paul Thompson

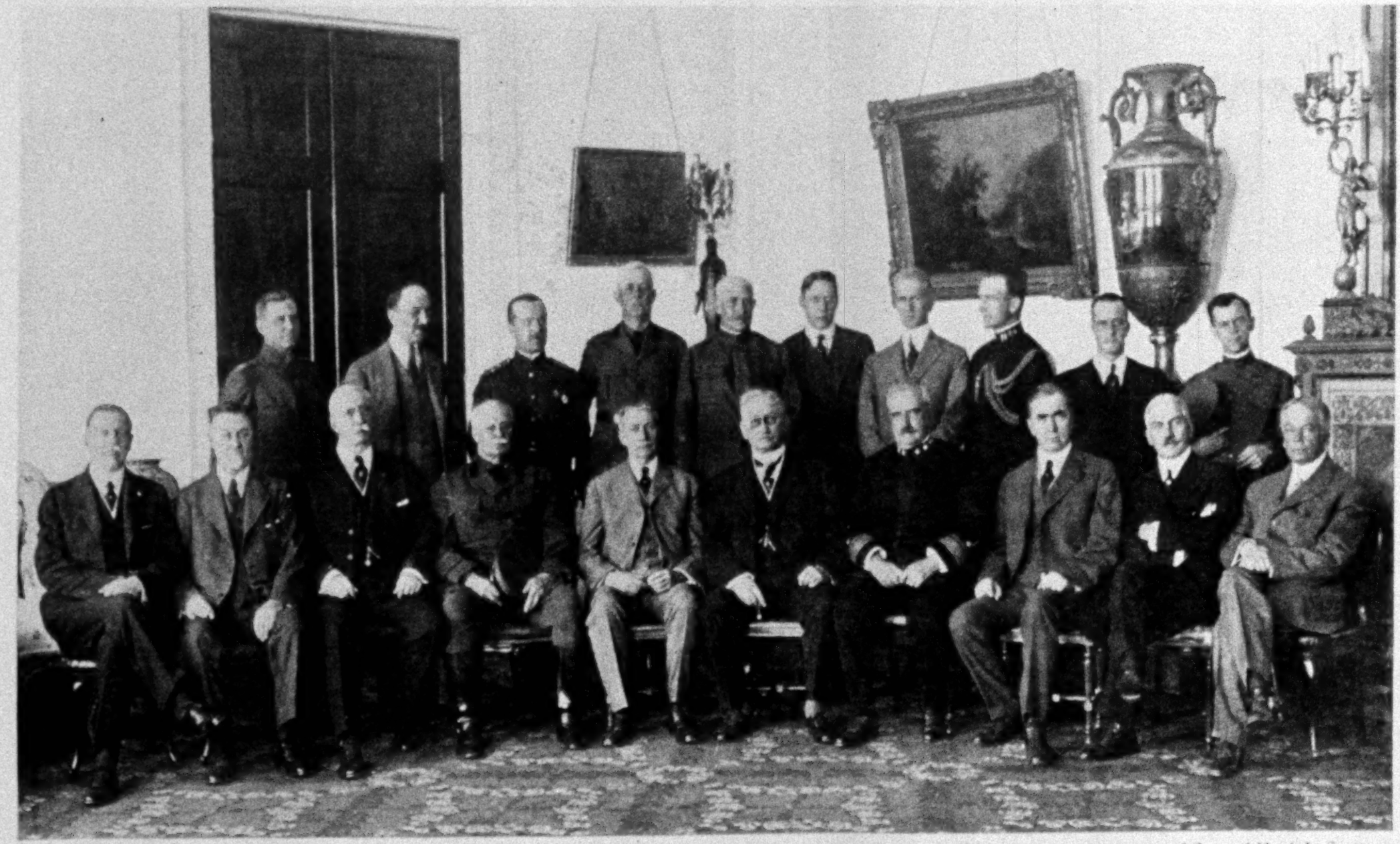
RUSSIAN SOLDIERS AND CIVILIANS IN THE DUMA HALL, SHORTLY AFTER THE OVERTHROW OF THE MONARCHY

A study of the faces in this remarkable assemblage will afford some idea of the multifold problems which faced the Provisional Government in its effort to satisfy the demands of all classes of Russians who for centuries had been crushed under the power of autocracy and who were now suddenly told that they were free, but without any definite idea as to what freedom means—that its preservation entails obligations as well as opportunities, sacrifices as well as enjoyment of its blessings.

Photograph by Paul Thompson

THRONGS BEFORE THE DUMA IMMEDIATELY AFTER THE REVOLUTIONISTS GAINED CONTROL OF PETROGRAD

"There has never been such a remarkable revolution in history. It has not represented plot and intrigue and ambitions of individuals. It represented merely the united desire of 180,000,000 people to carry on a war in which they believed, with the minimum of misery and the maximum of competence."



Photograph courtesy of General Hugh L. Scott

THE MEN WHO CARRIED A MESSAGE OF AMITY, ENCOURAGEMENT, AND GODSPEED FROM THE MOST POWERFUL REPUBLIC IN THE WORLD TO THE NEWEST SELF-GOVERNING NATION

The American Mission to Russia. Standing from right to left: Major Stanley Washburn, assistant secretary to the Mission; Basil Miles, secretary; Lieutenant Alva D. Bernhard, aide to Admiral Glennon; Surgeon Holton S. Curl, U. S. N.; Hugh A. Moran; Brigadier General Wm. V. Judson (detailed to remain in Petrograd as military attache to the American embassy); Brigadier General R. E. L. Michie, aide to the Chief of Staff; Baron de Ramsay, attache of the Russian Foreign Office; F. Willoughby Smith, assistant secretary and American consul at Tiflis; Lieutenant Colonel T. Bentley Mott. Seated from right to left: Charles Edward Russell, Samuel R. Bertron, John R. Mott, Rear Admiral James H. Glennon, Ambassador David R. Francis, Elihu Root, chairman; Major General Hugh L. Scott, Chief of Staff; James Duncan, Charles R. Crane, and Cyrus H. McCormick.

to take a more active part in the campaign of 1917, but that she has remained in the war at all, in spite of the sinister influences that have been brought to bear against her.

Crisis after crisis has been weathered in Petrograd, and in the latter part of July there came the German blows in Galicia, which at this writing seem to have produced results neither greater nor less than they have always produced in Russia, namely, a retirement of the Russian army to a new line of defense.

The military reverses have produced a political crisis in Petrograd, which Kerensky has again stemmed, and once more the ship of the Russian state has its head into the seas and is slowly moving on again.

The world should have realized in April that Russia could not contribute anything to the war this year other than holding fast on her present line while her people adjusted themselves to their new conditions. After three years of misery and disaster, Russia was entitled to this breathing spell perhaps, and because she has not contributed to a coördinated advance this year is no reason for us to conclude that she is finished for all time.

© Harris & Ewing

ELIHU ROOT, GENERAL HUGH L. SCOTT, AND THE UBIQUITOUS NEWSBOY AT A WAY STATION NEAR MOSCOW

Evidently the street urchin of Russia is no more impressed by proximity to greatness than his brother gamin of the New World. The Russian "newsie," true to the spirit of the day, wears a military cap tipped rakishly over his right eye and carries his papers in a portfolio, like an artist or a cabinet minister.

In judging Russia we must remember that again and again we have had crises which at the time seemed as crushing as the present situation. When I first went to Russia, in the fall of 1914, people were talking of the disaster in East Prussia as being a fatal blow and laying open the way to Petrograd. In 1915 for six months I lived in nothing but disaster and retreat, while my days were filled with dead and wounded men and my nights lighted by the flames of burning villages. Every road was choked with fleeing refugees and retreating armies.

The world at large said that Russia was finished, and in 1916 Brusilloff advanced for 70 days, taking half a million prisoners!

When Warsaw fell we heard on all sides the tale of an independent peace—a tale which never was justified by subsequent events. The Galician drive of

© Paul Thompson

REVOLUTIONARY SOLDIERS CHECKING UP PASSES OF THOSE DESIRING TO ENTER THE DUMA GROUNDS

"The Committee of the Duma, which took charge of the Provisional Government after the overthrow of the old régime, faced the most difficult problem which any group of men has ever encountered. It was their duty to keep the war going while the minds and the opinions of the people were readjusting themselves to an entirely new standard as to what the State really was."

1915 was the end of Russia. The German papers said it, and even during the Russian successes and victories of 1916 German prisoners kept insisting to me that the Russians were defeated in 1915, and that the victories in Volhynia were being won by Japanese infantry and French guns.

Late last fall, when the disaster of Roumania overtook us, we again heard the same wails of the pessimists, that at last Russia would stop. But after a few shudders in Petrograd the situation passed and Russia again continued on her way and her army still kept the field.

Now, it would be folly for me to assure the readers of this magazine that there is no possibility of Russia going out of the war; but what I do urge is that we all consider Russia in the past and judge the present situation from our knowledge of Russian character in this war. We know that the Russians have patience, fortitude, and courage equal to any people in the world. We have seen them face defeat and discouragements year after year since the beginning of the conflict, and after every tidal wave of misery we have seen them emerge, pull themselves together, and struggle on once more.

KERENSKY'S GOVERNMENT WILL NEVER MAKE A SEPARATE PEACE

There is not the slightest chance that the government headed by Kerensky will ever make an independent peace. The question is how long he can maintain his government in power. What may happen in the future is speculative; but I think one can say, without reservation, that his hold on the government is stronger now than it has ever been. The first flush of the new liberty has worn off, and the people of Russia are perhaps beginning to realize that liberty does not

PARADING BEFORE THE WINTER PALACE IN PETROGRAD

In striking contrast to the terrible bloodshed which marked the overthrow of autocratic monarchy in France a century and a quarter ago, the Russian revolution was accomplished with astonishing orderliness. There was no looting whatsoever. All the priceless art treasures of the deposed Tsar's palaces in Petrograd and at Tsarskoe Selo remain intact.

mean the freedom of the individual to abandon work and do nothing.

Perhaps it is too soon to say that the crisis has passed in Russia; but it does seem as though the fallacies of the German propaganda were being recognized and its strength being diminished. That we will have more crises in Russia is beyond doubt; but we in America must view them without panic or undue pessimism, trusting in the character of our allies as shown in the past, helping them morally and materially where we can, and sympathizing with them in this their first great trial at democracy.

The retirements of the Russian army need alarm us only to the degree in which such movements threaten to end the war In France or in Flanders the loss of terrain threatens the issue, but in Russia the only vital objective of the enemy is the Russian army itself. The loss of food-producing territory in Galicia and Podolia is, of course, regrettable; but as long as the army keeps getting away we need not be too fearful as to the issue. It must always be remembered that the greatest help Russia can give us is by fighting at the same time that we are fighting, and, broadly viewed, it is of relatively small moment whether she is fighting in Poland or whether she is standing on a line in front of Kiev, Moscow, and Petrograd.

THE PATHETIC PLIGHT OF ROUMANIA

The winter in Russia promises to present many hardships, and we must, with evenly poised minds, watch with solicitude and concern, helping where we may her struggles during the next six months, bearing in mind always that with an army of 3,000,000 enemies in the heart of her great country next spring, she may help us end the war next year; but with Russia at peace at least two years must elapse before a supremacy in the

Photograph from General Staff, Roumanian Army

THE HIGH COMMAND OF THE ROUMANIAN ARMY

King Ferdinand stands near the extreme left of the picture, leaning on a cane. The officer wearing the numerous decorations is General Averesco, commander-in-chief of the Roumanian forces.

West, based on man power, will enable us to force a military decision.

In inviting sympathy for and patience with the unfortunate Russians in this their moment of extreme trial, one must not forget the plight of poor little Roumania, whose fortunes are bound up with Russia. Roumania entered the war with her eyes open as to what would happen if she failed. She had been led to believe that the Germans could not send above ten divisions against her, and they sent thirty. The Roumanians have played the game as they were urged to do, and as a result now hold but a quarter of their country, and that small relic threatened. In spite of it all they have held true to the cause, and are fighting harder and better today than when they first entered the campaign. We have to her as to Russia the moral obligation of support, both in sympathy and in material, where transportation facilities will permit. Both of these countries, according to their capacities, have contributed all that was in them to the cause, and whatever happens, be it good or bad, the part both have performed in wearing down the enemy that we might ultimately deal with them must be neither overlooked nor forgotten.

INDUSTRY'S GREATEST ASSET—STEEL

By William Joseph Showalter

SURELY that is a stranger alchemy than was possessed by the genii who peopled the days of the Arabian Nights, which can take crumbling brown hematite ore from the ranges of Minnesota, friable black bituminous coal from the heart of the mountains of Pennsylvania, crushed gray limestone from the quarries of Ohio, soft red copper from the mines of Montana, downy white fiber from the fields of Alabama, pungent drab dust from the nitrate region of Chile, impalpable yellow sulphur from the beds of Louisiana, and, adding to them the level-seeking impulse of Niagara's waters, compound potions out of whose fumes rise guns and swords and shells and explosives which must conquer the power that has made the whole world afraid.

And yet, stripped of its confusing details, such is the wonderful story of the making of the vast quantities of the fundamental munitions of war and of the great task which falls to the lot of industry in the world's common cause against Germany. It is a magic tale in which fact outruns fancy, truth makes fiction an unimaginative fabricator, and the real appears more strange than the extravagancies of a dream. But when we have seen the yielding hematite, as soft as a sand pile, becoming crucible steel, whose hardness is adamantine; when we have watched the odors from the coke oven becoming pent-up power mightier than ten thousand demons; when we have beheld the cotton of the field become so highly explosive that it must first be tamed before it is docile enough for use even in the biggest of guns, then we will appreciate some of the weirdly wonderful transformations that science, applied to industry, can produce.

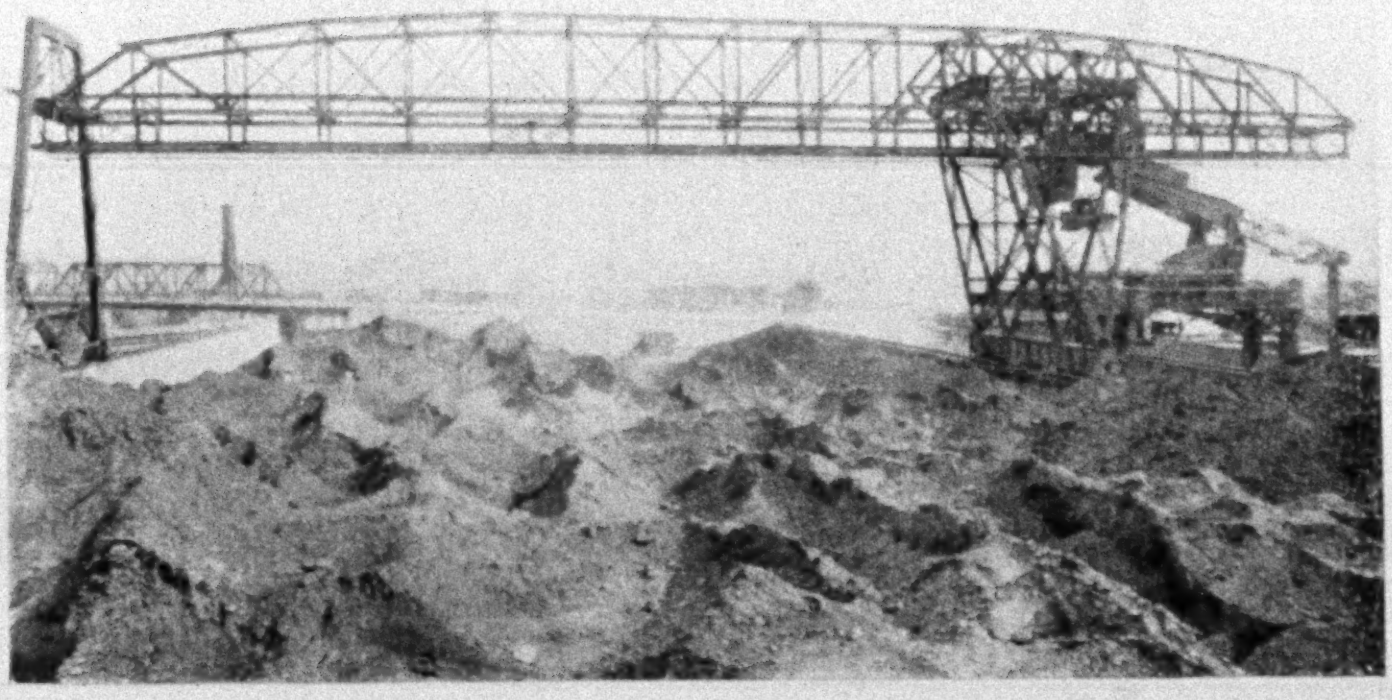
THE GENESIS OF STEEL

The present article deals only with one phase of this marvelous story—the making of the steel for the guns and shells which America will use in her war against the Kaiser and his cohorts. It naturally begins at Hibbing, Minn., the iron-ore capital of the world and the richest village on the planet; for here is located the Hull Rust mine, a hole in the ground which rivals Galliard Cut at Panama.

Most streets in Hibbing begin at one man-made precipice and end at another; for, not content to be the proud possessor of the biggest iron mine in existence, this enterprising little metropolis has gathered several other sizable ones around her as a hen gathers her brood. In 1910 the population of the iron town was less than nine thousand, and yet it had a street-lighting system as ornamental as that of Cleveland, Minneapolis, or Detroit, and far more beautiful than that of the nation's capital. Great bronze posts surmounted by groups of four or five arc lights make the village—for it is too rich and prosperous and content to aspire to the rôle of town or city—appear the last word of modernity in municipal lighting.

The streets are paved, and everybody seems to have an automobile; so that street-cars would be about as necessary as a fifth wheel to a wagon. Going up to Hibbing from Duluth, one gets his first idea that the ore capital must have money to burn, for in the parlor cars and day coaches alike appear signs which warn against playing cards for money in railroad trains.

To get some idea of Hull Rust mine, imagine a great terraced amphitheater cut out of rolling ground, half a mile wide and nearly two miles long. Dump Gatun Dam into it and there would still be a yawning chasm unfilled. Put a ten-story office building into its deepest trench and the top of the flagpole would barely reach to the line of the original surface (see page 124).



AN ORE STOCK PILE AND HANDLING MACHINERY: CLEVELAND, OHIO

Many furnaces are located on the banks of navigable waters and the ore is unloaded directly on their stock piles. As the lakes are navigable only from the latter part of April to December, great mountains of ore must be piled up in reserve for the winter season. This is delivered to the blast furnace by cranes and other apparatus.

ORE HANDLED LIKE SAND

Ordinarily one thinks of mining as an occupation for human moles that burrow in the ground and bring out hard ores from cavernous depths. But when Nature laid down the Lake Superior ore ranges she made burrowing and blasting unnecessary for the most part. In the Mesaba Range—and, by the way, there are as many ways of spelling that word as there are of pronouncing Saloniki—the ore has largely the consistency of sand, and lies so close to the surface that it would be as foolish to burrow instead of digging as it would be to tunnel instead of cutting in building a railroad through a small knoll. There is a general rule among the ore miners up Mesaba Range way that it is profitable to dig rather than burrow where there's not more than a ton of soil above for each ton of ore beneath.

When one who has visited Panama reaches Hibbing he can almost imagine that Uncle Sam is so enamored of the job of removing mountains with the faith of enterprise that he has decided to repeat his Isthmian performance in Minnesota; for they certainly do "make the dirt fly" up there. Uncle Sam borrowed their steam-shovel idea when he tackled Culebra Mountain, and handled it so successfully that all of the world's excavation records fell before his work there. But with the quickened demand for iron and steel that the world war has engendered, the pennant to the world's champion diggers has passed back from the Chagres River to Lake Superior.

Yardage was king at Panama, but tonnage is czar on the Minnesota ranges. At Panama the question was how big a hole could be dug in a day; in the iron-range region it is how many tons of ore can be sent down the lakes a season. It's somewhat uncanny to see a whole battery of steam shovels biting into the soft red stuff that looks like a cross between the sand pounded out of red sandstone by

rivers and the loamy brown clay of the fields, and to realize that it is the raw material which will determine the fate of nations and mayhap transform the course of the world's history.

And how they do make hay when the sun shines up on the iron ranges! Panama had its rainy season, but the iron ranges have their snowy season, beginning in December and ending with Easter, when that festival happens to be late enough. They have only eight months in which to meet the vast demand of the nations for iron and steel, and that demand last year called for nearly 67,000,000 tons of ore from them. That meant more than 46,000,000 cubic yards of material, or nearly one and a half times as much for the average month as the best month in Panama's history can show. Think of it—more material dug out, loaded onto cars, transhipped to ore boats, and carried a thousand miles in eight months than Panama was ever able to take out and haul an average of ten miles in fifteen months!

INTENSIFIED LABOR-SAVING

How do they do it? They do it with the most wonderful lot of man-eliminating, time-saving, obstacle-conquering machinery ever put to a thousand-mile purpose. The Hull Rust mine, to begin with the ore in the ground, is a series of terraces, or benches, as the engineers call them, from the banks to the bottom. On each of these Brobdingnagian steps there is room enough to maneuver a steam-shovel and a railroad train, and up and down the line go the shovels, shifting their positions as they eat into the bank, and loading a big ore train in less time than a child with a toy shovel could fill a little red express wagon. Day and night the work goes on—two tons to the shovelful, five shovelfuls to the minute, and five minutes to the carload. Not long ago a steam-shovel loaded 7,689 tons of ore as a single day's work.

The ore cars on the iron ranges are of the regulation pressed steel, bottom-dumping, 50-ton coal-car type, and they run in trains a third of a mile long. The railroads from the mines down to Duluth, Superior, and Two Harbors are of the best construction, like the main lines of our biggest eastern roads. The trains crawl through the hills and vales that Proctor Knott declared, in his celebrated speech in Congress, would not, except for the pine bushes, "produce vegetation enough in ten years to fatten a grasshopper," but where today, nevertheless, there are communities in which farmers are now growing three and four hundred bushels of potatoes and thirty bushels of wheat to the acre. Where gold and silver were located on the map Knott made famous, one now finds the richest iron mines of the world—mines that beggar the bonanzas of California.

The haul from Hibbing to Duluth is 80-odd miles. Just before the trains reach Duluth they come to Proctor, the biggest ore yard in the world. Here they run across a scales unique in the history of the art of weighing. There would be an endless congestion and a consequent shortage in steel were it necessary to stop each car on a scales and weigh it; so a weighing mechanism has been devised which permits the tonnage of cars in motion to be registered. A train slows down as it approaches and passes over the platform at the rate of from five to eight miles an hour, the weight of each car being automatically recorded as it passes.

From Proctor the trains run down to the huge unloading piers at Duluth. These piers are vast platforms built out over the lake, nearly half a mile long and wide enough to accommodate two tracks, which are at the height of a six-story building above the water. Beneath the tracks is a series of pockets, holding some two or three hundred tons of ore each. The ore is automatically dumped into these pockets and the train starts back to Hibbing (see page 128).

Even while the trains are dumping their burden ships are alongside with huge spouts in every hatch and a hatch every 12 feet, with ore flowing down out of the pockets like water out of a funnel, at the rate of some 80 tons a minute, as a rule, and as much as 300 tons as the exception.

Photograph by L. P. Gallagher

VIEW OF A PORTION OF ONE OF THE BIG OPEN-PIT MINES ON THE MINNESOTA RANGES

"Even if we have furnaces as large as yours," once declared a manager for Krupps, "even if we have your machinery and your skill and our organization, and coal as plentiful as yours, we haven't your ore." And that is one of the reasons why the United States was able to produce more than half of the world's pig iron last year. Most of the ore is scooped up by steam-shovels, like sand (see page 122).

AN OLD SALT'S OPINION

These ore ships are a story in themselves. They remind us of the exclamations of an old Cape Cod salt who beheld one for the first time: "Now clap your eyes on that! D'ye call that a ship? Why, I'm telling you a loggy lighter with a tenement-house on one end and a match factory on t'other would look better'n that rum-looking craft. How'd the skipper and the chief engineer ever get acquainted? And what if one of 'em wants a chew of tobaccer from t'other? And you say the skipper bunks in the skys'l fo'c'stle forward while the cook and ship's boy has the quarterdeck? Well, I wouldn't ship as rope yarn on such a bloody drogher!"

The big freighters do in general outline fit the old salt's sketchy description. Some of them are more than 600 feet long and only 60 feet beam. With officers' quarters and bridge in the bow and crew's quarters and engine-room in the stern, and all of the rest of the ship without superstructure of any kind, and with a flat deck with hatches spaced six feet apart, a salt-water sailor might well regard them as uncanny apparitions of the unsalted seas. The *William P. Snyder, Jr.*, 617 feet long and 64 feet beam, drawing about 20 feet 6 inches of water, when loaded to capacity, broke the world's bulk freighter record in 1916, carrying 13,694 tons of ore on one trip.

These big ships, in spite of the fact that they are able to work only eight months and notwithstanding the wonderfully low ton-mile freight rate they offer, are veritable gold mines. With the progress in the art of bulk freighter construction that a quarter of a century has brought forth, miracles of efficiency have been wrought. Vessels of the largest type are operated today with engines of the same pattern and power as were fitted into ships of one-third their tonnage two decades ago. Indeed, so economical in operation are the big ore carriers of today that they use only a shade more than half an ounce of coal in carrying a ton of freight a mile—a statement so remarkable that one could not believe it except upon the authority of R. D. Williams, editor of the *Marine Review*. Another authority puts the cost of operating such a ship at between $200 and $300 a day.

Even at the latter figure and ten days to the trip, with cargo only one way, the cost of a trip to the owners is only $3,000, while the receipts were $6,000 last year, and at this year's rate will be $10,000. But even at a dollar a ton, moving ore a thousand miles in these vessels costs only one-sixth as much per ton-mile as moving it on the railroads.

PROCTOR KNOTT'S UNMEANT PROPHECY

As one stands at Duluth today and sees the endless procession of ships that glide down the lakes, with their cargoes of potential steel and promised victory, and then reflects upon the picture the great satirist, Knott, drew of the state of the nation, in the event of a foreign war, without Duluth and "the prolific pine thickets of the St. Croix," there comes a realization of how the jest of yesterday may be the solemn truth of today. Without the iron and steel and wheat of the region he joked about, we might in very truth come to find all our ports blockaded; all of our cities in a state of siege; the gaunt specter of famine brooding like a hungry vulture over our land.

It is hard for the mind to grasp what the iron ranges of the Lake Superior region have meant to us. They give the nation all but one-sixth of its iron and steel, and made possible until a few short months ago the production of a pound of iron at a cost of less than three-fourths of a cent. Our railroads, our steamship lines, our factories, all the things that make America potentially the strongest nation on God's green earth, draw their life from the iron ranges. Last year they contributed enough ore to make a wall around the United States a yard thick and 8 feet high. Since they were first opened up they have supplied enough ore to inclose the country with an ore pile of natural slope with a base wider than the road-bed of a standard double-tracked railroad.

One senses something of this vast traffic as, stopping for a day at the Soo locks, he sees that wonderful procession of ore carriers sweeping down through the great ship stairs and back again, as if they were

Photograph by Hugh Kennedy

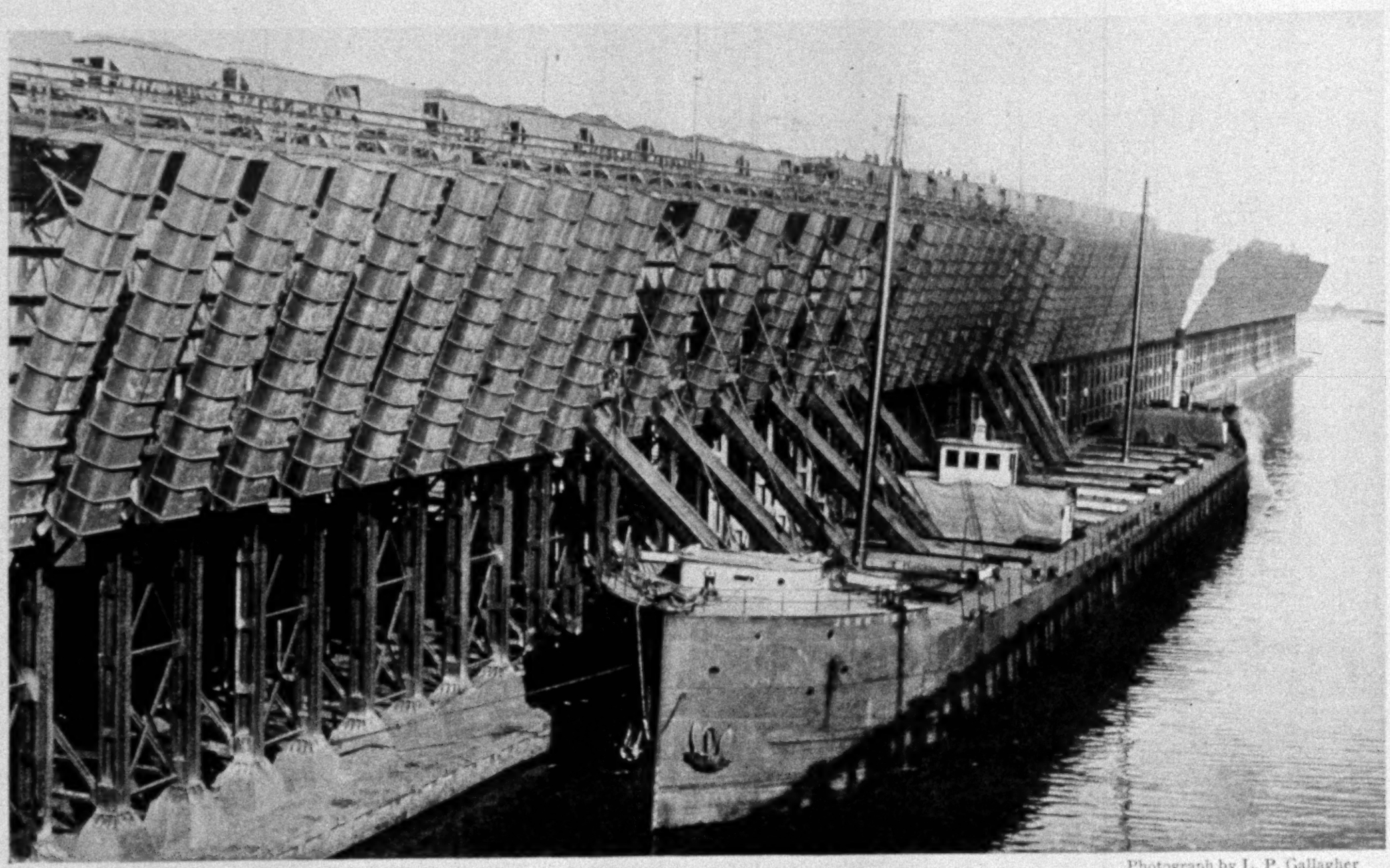
A QUARTER OF A MILLION TONS OF PIG IRON AT BUFFALO

This mountain of metal was handled by an electro-magnetic crane. It is interesting to watch such a crane loading a car. The lifting arm goes out over the pile, the cable drops the magnet down into contact with the "pig," a little lever is moved, and the inert magnet takes unto itself invisible power as great as that of steel grappling hooks. Then the cable pulls up the magnet and its tons of adhering "pigs," the arm swings around, the magnet is let down into the car, the current is turned off, and the invisible hold released. Cars are loaded to exact quantities, and the finishing process reminds one of the grocer weighing out a bag of sugar. The man at the scales calls out, "One thousand short." The craneman thereupon cuts off a tiny bit of current and a corresponding number of "pigs" drop into the car. Now there is slightly too much, and the craneman adds more "juice" to the magnet, which picks up a pig or two and the scales balance.

Photograph by McKenzie, Duluth

PARK POINT OR MINNESOTA POINT AND DULUTH HARBOR

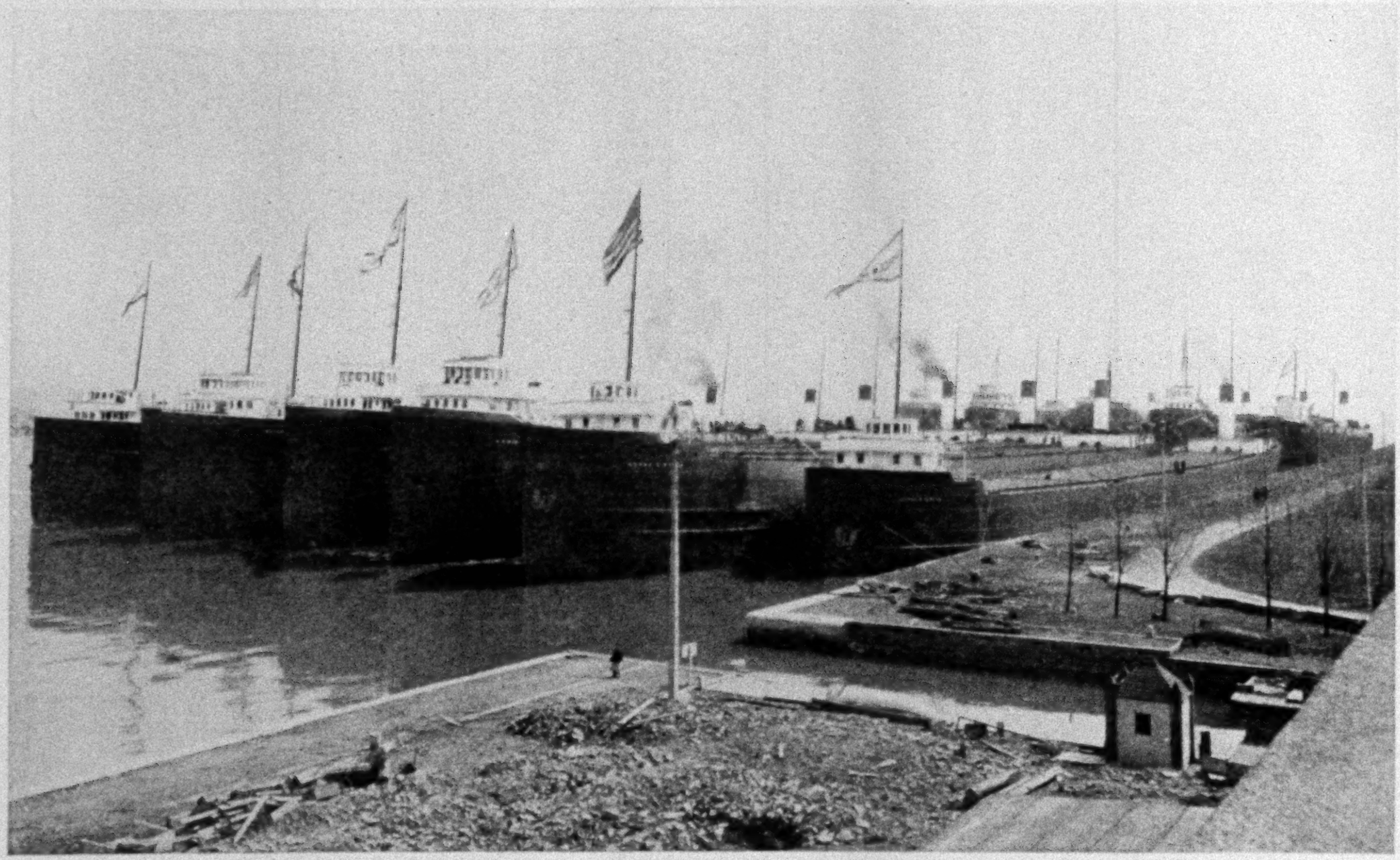
It is hard to realize that the output of pig-iron in the United States in 1916 was greater in tonnage than the world's total output only twenty-five years ago. Dulnth's ore and grain shipments last year gave it a greater outgoing tonnage than any other two ports in the world. The bridge shown in this picture is the only one of its kind in the United States. It is 365 feet long and 185 feet high, and spans the harbor entrance to "The Zenith City of the Unsalted Sea," as the mineral metropolis calls itself.



Photograph by L. P. Gallagher

LOADING AN ORE STEAMER AT ONE OF THE GREAT STEEL AND CONCRETE PIERS IN DULUTH

The largest of these docks is nearly half a mile long. The world's record for ore handling was made in 1909, when the freighter *William E. Cory* took aboard 9,457 tons in twenty-five minutes, or 378 tons a minute. It is no exceptional performance for a big ore boat to take aboard 10,000 tons in an hour. Note the cars on the dock ready to be dumped into the pockets that connect with the spouts through which the ore is passed by gravity into the ship's hold (see page 123).



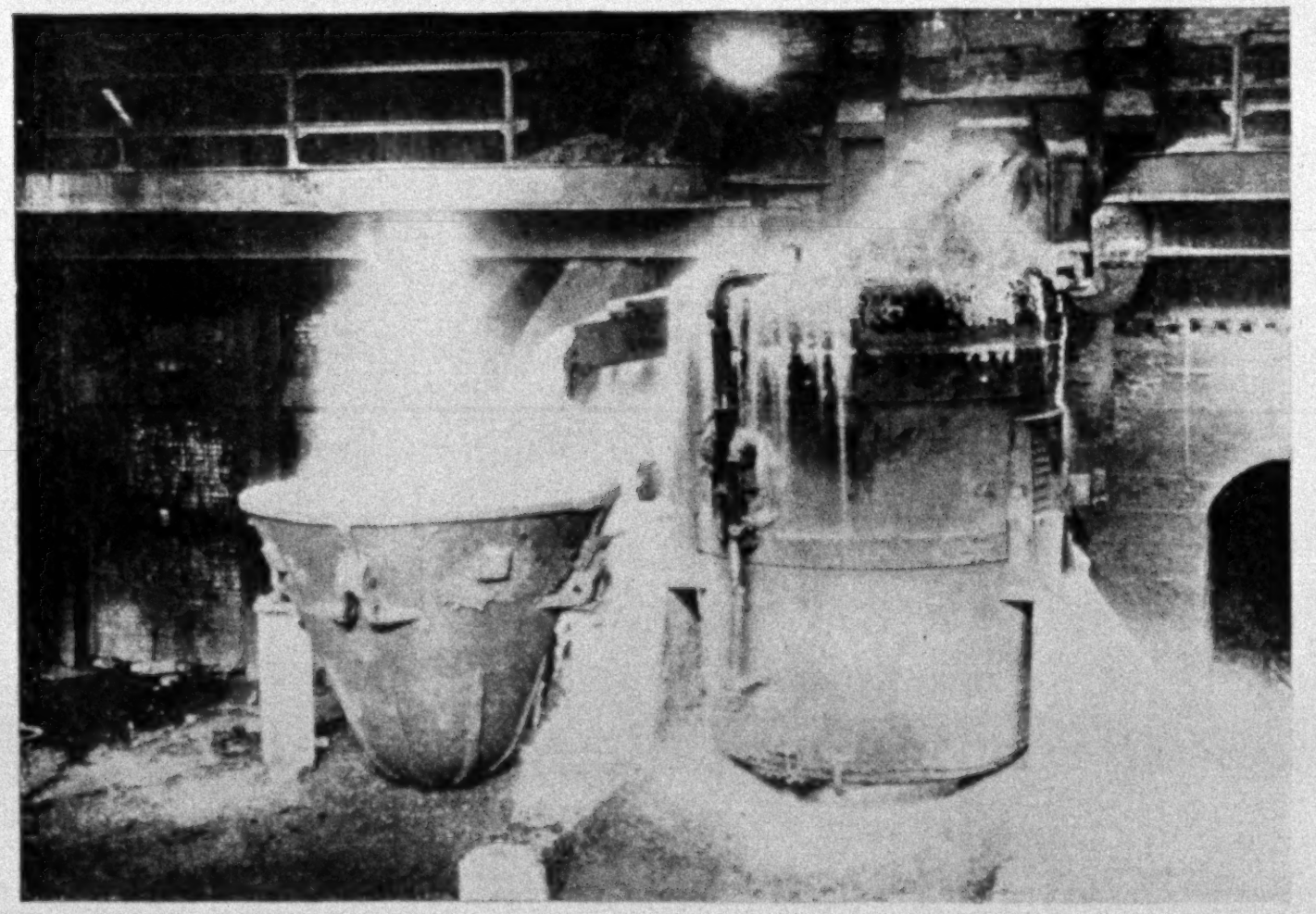
Photograph by A. E. Young

AN AMERICAN BLOCKADE: ORE SHIPS TIED UP AT THE SOO LOCKS

Who can say how much America owes to the Great Lakes? Last year the freight passing through the Soo locks alone represented a movement equivalent to that of hauling an 800-ton load of freight from the earth to the sun.

BESSEMER CONVERTERS AT WORK

As pig iron comes from the blast furnace it still possesses certain impurities, such as carbon and silicon. The mission of the Bessemer converter is to get rid of these. It is a huge egg-shaped steel container, lined with fire-brick, and mounted on trunnions so that it may be tilted and its liquid contents poured out. By means of a blower a tremendous supply of oxygen is driven through the molten metal, taking off with it all the carbon as it goes. After the blower has been turned off, a scientifically measured quantity of carbon is added to give the contents the characteristics of carbon steel (see text, page 151).



Photograph from Brown Brothers

TAPPING AN OPEN-HEARTH FURNACE IN A MODERN STEEL MILL

When an open-hearth furnace is tapped a big ladle is brought into position, a workman runs a crowbar through the clay stopper holding back the molten metal, and it runs out like buttermilk from a churn. What slag accompanies it rises to the top as oil on water and overflows the sides when the ladle becomes full of the melted steel. Once filled, the ladle is picked up by a crane and its contents dumped into molds to harden into ingots. This is the first process in making the major portion of the country's steel and is now almost exclusively used in making steel rails

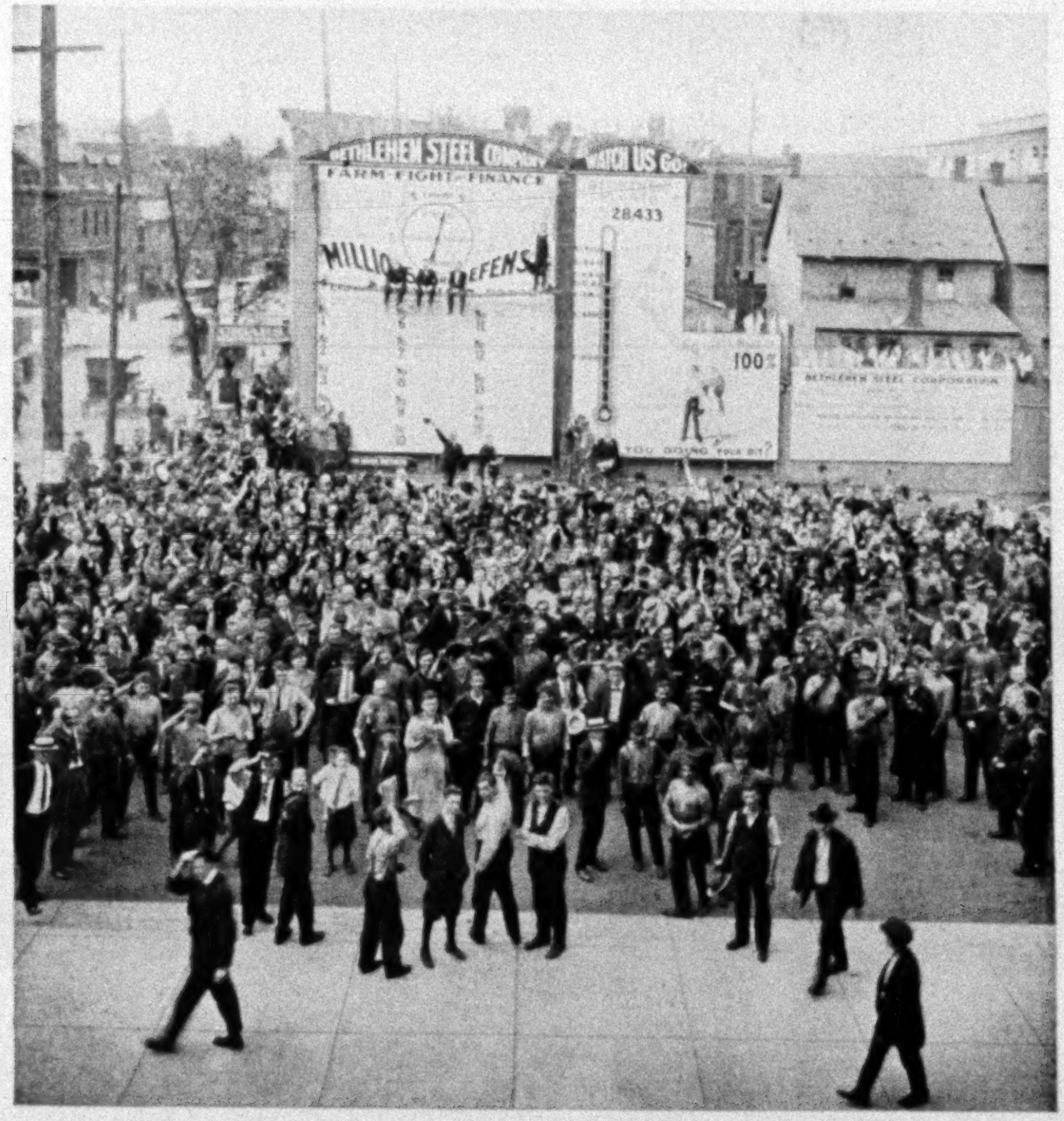
an endless chain turning round sprockets at the head and foot of the lakes, with the Soo locks as an intermediate support.

GLORIFIED WALKING BEAMS

When the big ore carriers arrive at the lower lake ports—Lorain, Cleveland, Ashtabula, Conneaut, Erie, and Buffalo—they hasten up to the ore-handling plants, every hatch open and ready for the unloading. Gravity may load a ship, but it has never yet unloaded one, and so machinery does the work. Instead of the old way of hoisting shovel-filled buckets by horse-power and dumping them into the wheelbarrows of picturesque longshoremen, a method by which it cost 50 cents a ton to get the ore from hold to car or pile, today gigantic unloaders, the most modern of them grabbing up 17 tons at a mouthful, save so much labor that it costs in some cases less than five cents to take a ton of ore out of the hold and put it on the small mountain the ore folk call the stock pile, or in empty railroad cars waiting on the track hard by.

The Hulett unloader reminds one of a glorified walking beam of the sidewheel steamboat variety, with one of the legs left off. Instead of the other leg connecting with a crank shaft, it has a wonderful set of claws at the lower end, and above them an ankle of startling agility. These great claws open and shut by electricity, and they take up 17 tons with as much ease as you might close your hand on an apple. The operator is stationed inside the leg just above the claws and gets all the sensations of riding a roller-coaster, as he jumps in and out of the ship hour after hour (see page 134).

When the claws are full, the operator turns a lever; the walking beam seesaws back to the opposite position; the load



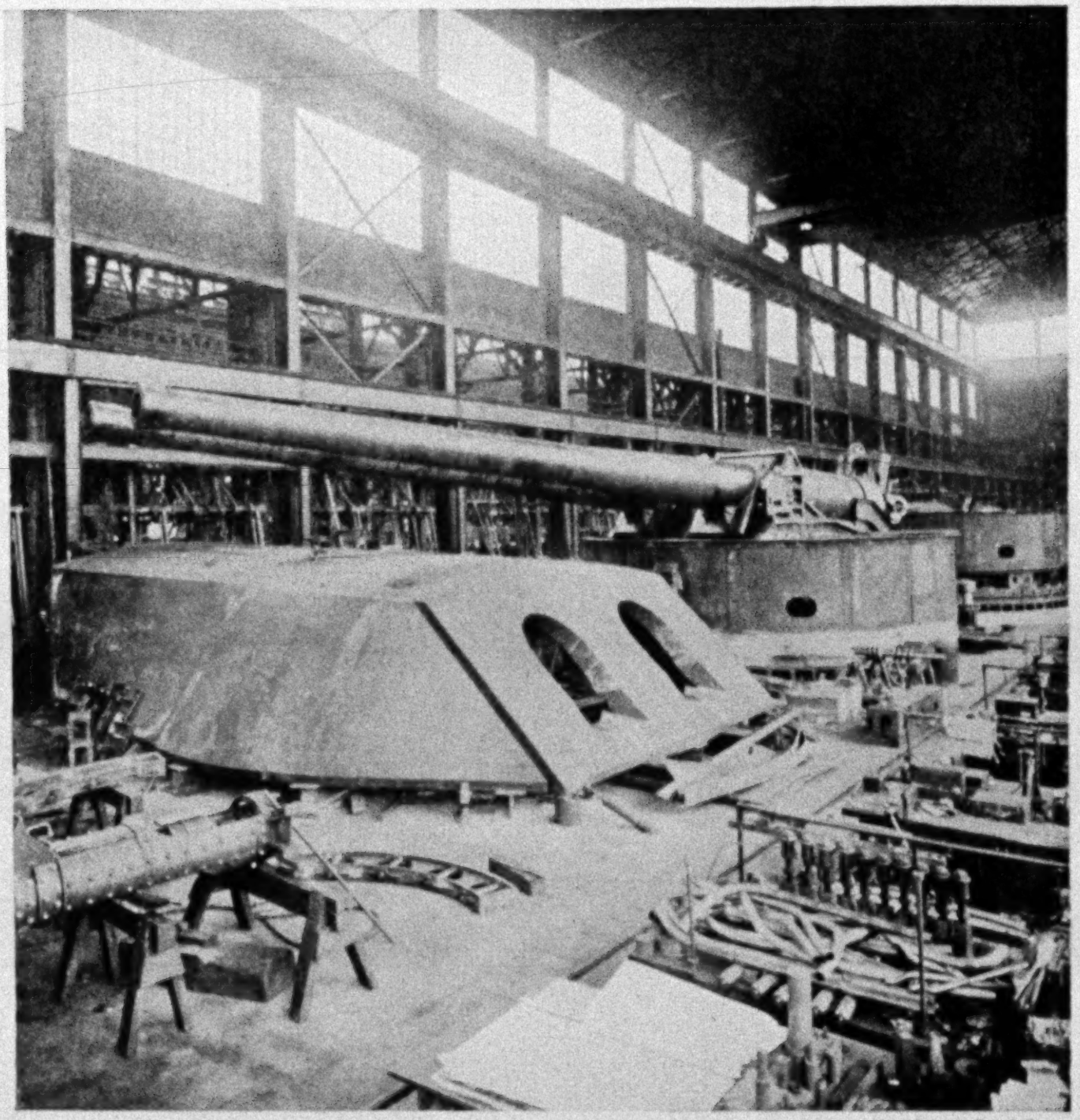
ANOTHER VARIETY OF MEN BEHIND THE GUNS

These men are twice men behind the guns in the cause of America. They subscribed more than five million dollars to the Liberty Loan, and they are doing their bit to furnish the battle front with the artillery that must ultimately hammer an unstoppable hole through the lines of the enemy.

comes out of the hold and is dumped into a bin. From this bin it flows by gravity into big coal and ore cars to be hauled to the furnaces, or else is delivered to the buckets of the great cantilever bridge, which carry it across to the big stock pile. Once it took a week, with a regiment of men, to unload a small ship, whereas now half a day and a corporal's guard can send the biggest ore carrier afloat on its way empty.

There are several other types of unloaders, some of them having huge horizontal beams reaching out over the hatches of the ship and forming trackways for the big buckets that run out to the end on carriages, and then drop down on a cable into the hold for a load of ore. Whoever has watched a farmer store hay away in his barn with a modern hay fork will understand the rôles the beam and the cable play.

The mining and navigation season being only eight months long, the ships must bring in enough ore to keep the furnaces running during the additional four



Photograph from Bethlehem Steel Co.

FOURTEEN-INCH GUNS AND TURRETS UNDER CONSTRUCTION

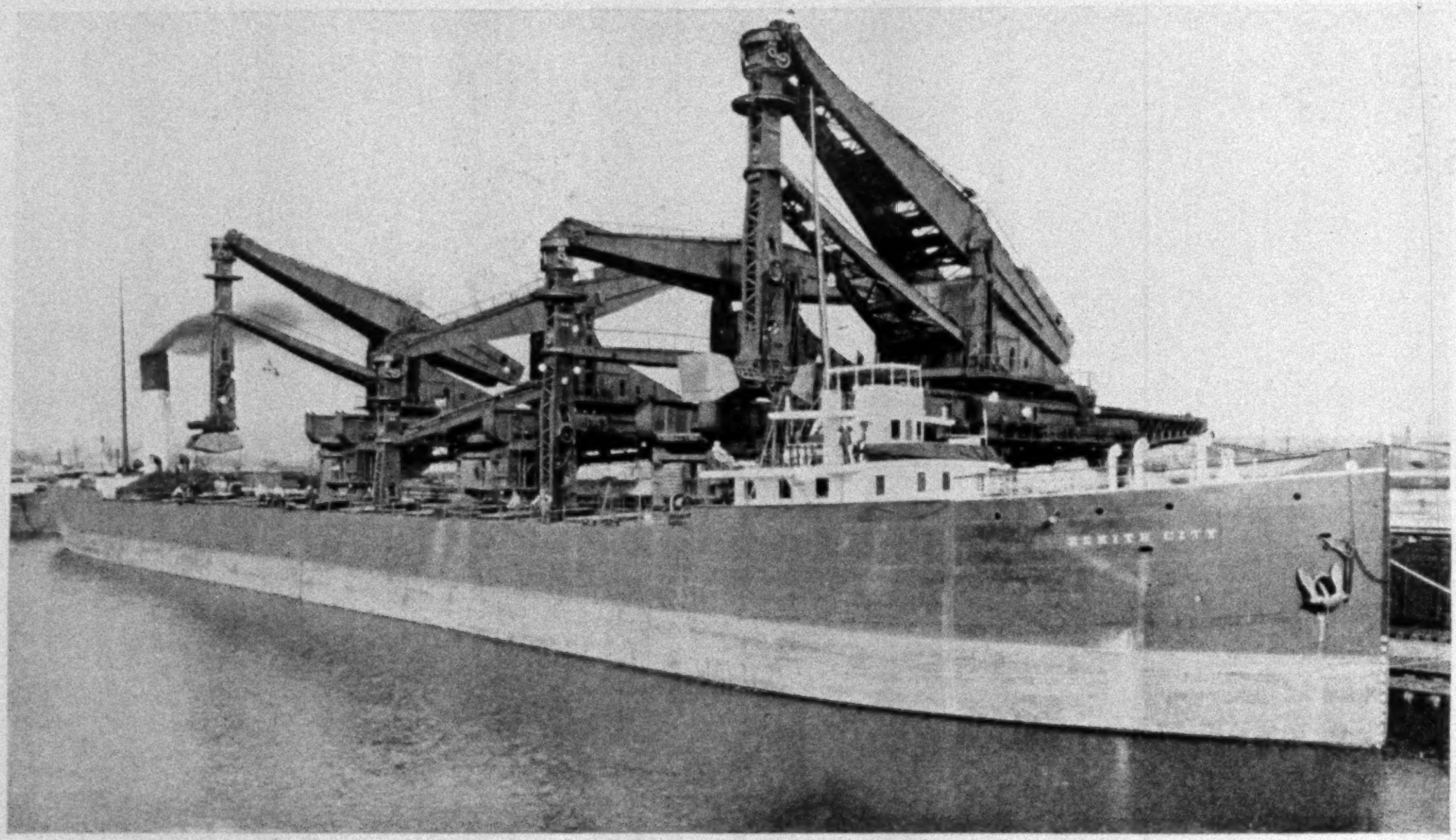
Such big guns as these can send a projectile weighing two-thirds of a ton flying through space at an initial velocity of 20 miles a minute. They require some 600 pounds of powder for each shot, and give the projectile a twist that makes it whirl as it flies—a complete turn for every 30 feet it travels.

months, and so the red ore pile is seen everywhere at lake ports and furnace plants. Many of the furnace plants are right alongside the unloading docks and save the cost of railroad haul. But there are still millions upon millions of tons of ore that must take a second ride by rail before it can reach the hour of its transformation into pig iron.

Having followed the ore from the mine to the furnace stock pile, omitting any account of underground mining and milling because of their relatively small contribution to the total ore production, and also omitting the story of the concentration of lean ores, let us now watch the assembling of the other materials that go into the furnace.

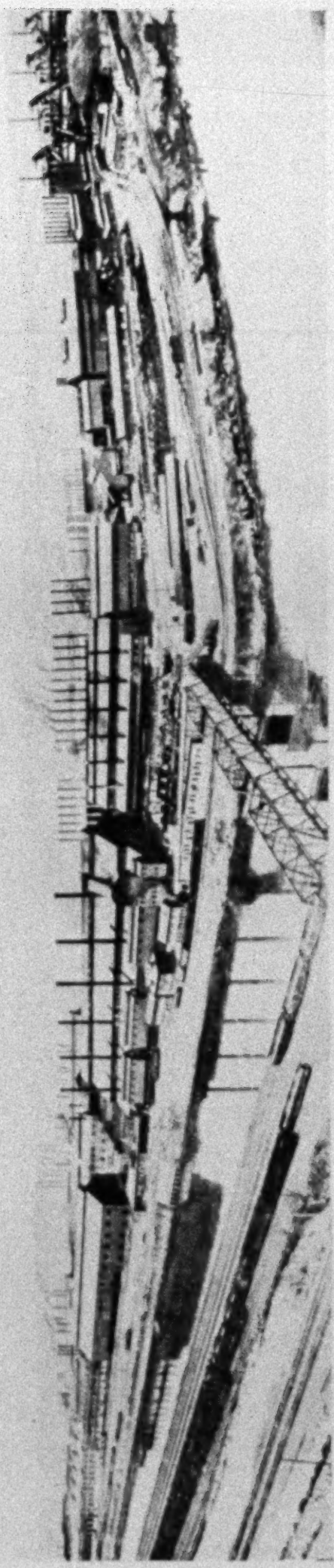
MAKING COKE FOR BLAST FURNACES

The coal comes in the main from Pennsylvania and West Virginia. A famous coal region that furnishes coking coal is the Connellsville district. Let us go to Standard Mine No. 1 there and have a look. It sends up 50 tons of coal every



HULETT UNLOADER REMOVING THE ORE FROM A LAKE FREIGHTER

This view gives one at once a striking idea of the imposing dimensions of a lake freighter and tells an eye story of the unloading equipment. The unloader in the foreground, with its 17-ton bucket open, is ready to grab a load when the walking-beam dips down. The second is beginning to bring up its bucketful; the third one is in the act of taking its mouthful; the fourth has been down, has filled itself, and is ready to discharge. A battery of these busy giants has transferred as much as 11,083 tons of ore from the hold of a ship to the stack pile in three hours and forty minutes. Note the man in the leg of the first unloader; he dives in and out of the hold as bucket operator all day long. Note also the two on the bridge and those along the starboard rail (see also page 131).



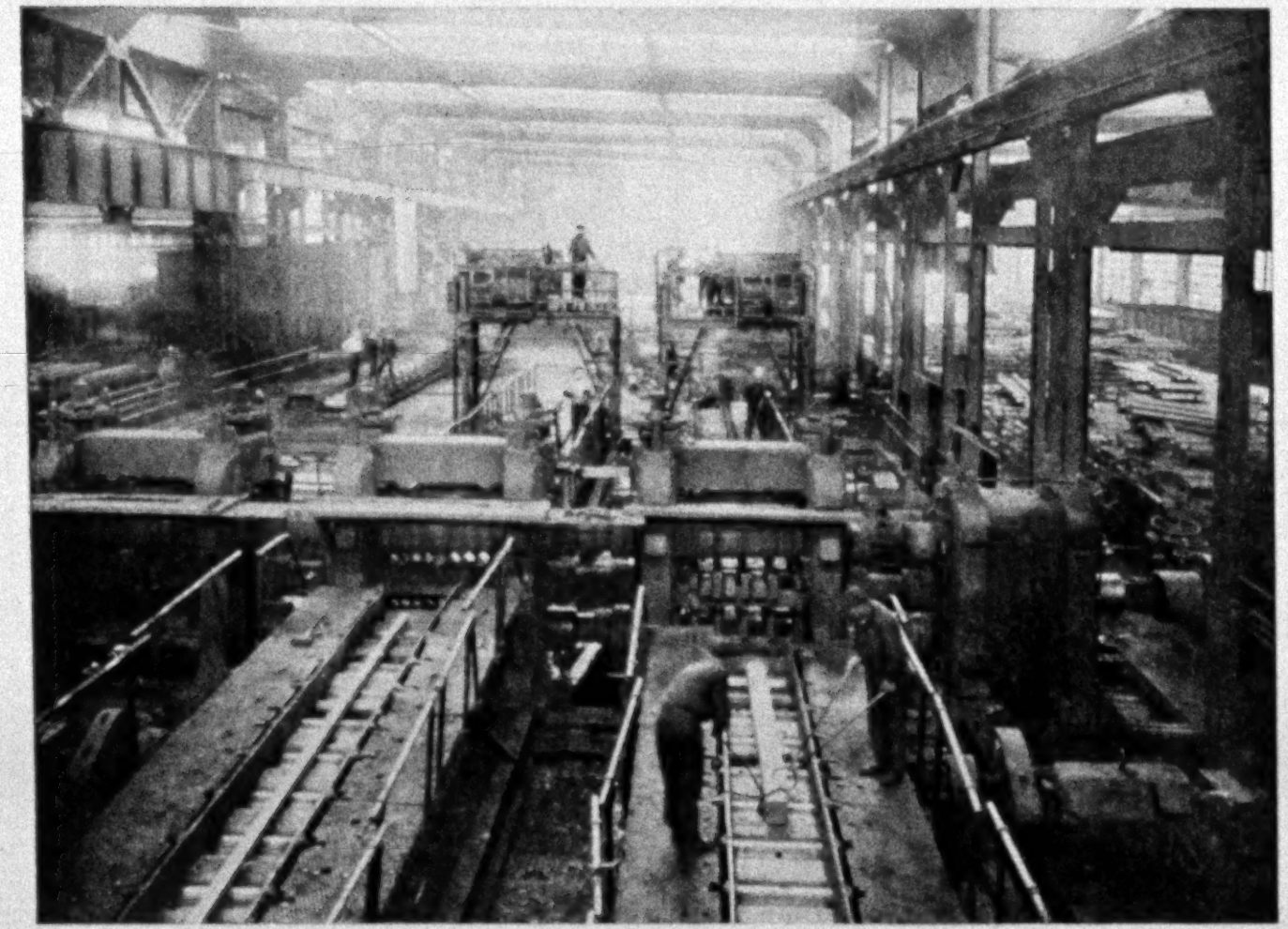
ONE OF THE GREAT STEEL PLANTS AT YOUNGSTOWN, OHIO

hour. Going down the shaft to the bottom of the mine, one finds a subterranean village, with a windowless office building as a part of the equipment. The whole village is electrically lighted, and it is easy to imagine one's self in an underground Latin-American plaza, with stores all around. The streets run off in every direction; but instead of street-car lines there are coal trains drawn by steam engines that have no fire-boxes. Strange sort of locomotives, eh? Well, you see, fire has no place down in a mine, and so they generate the steam up on top of the ground and send it down through pipes to the engines. A huge locomotive, with a 50-car train tagging on behind, and with never a bit of smoke, makes the streets of this underground world look eerie indeed.

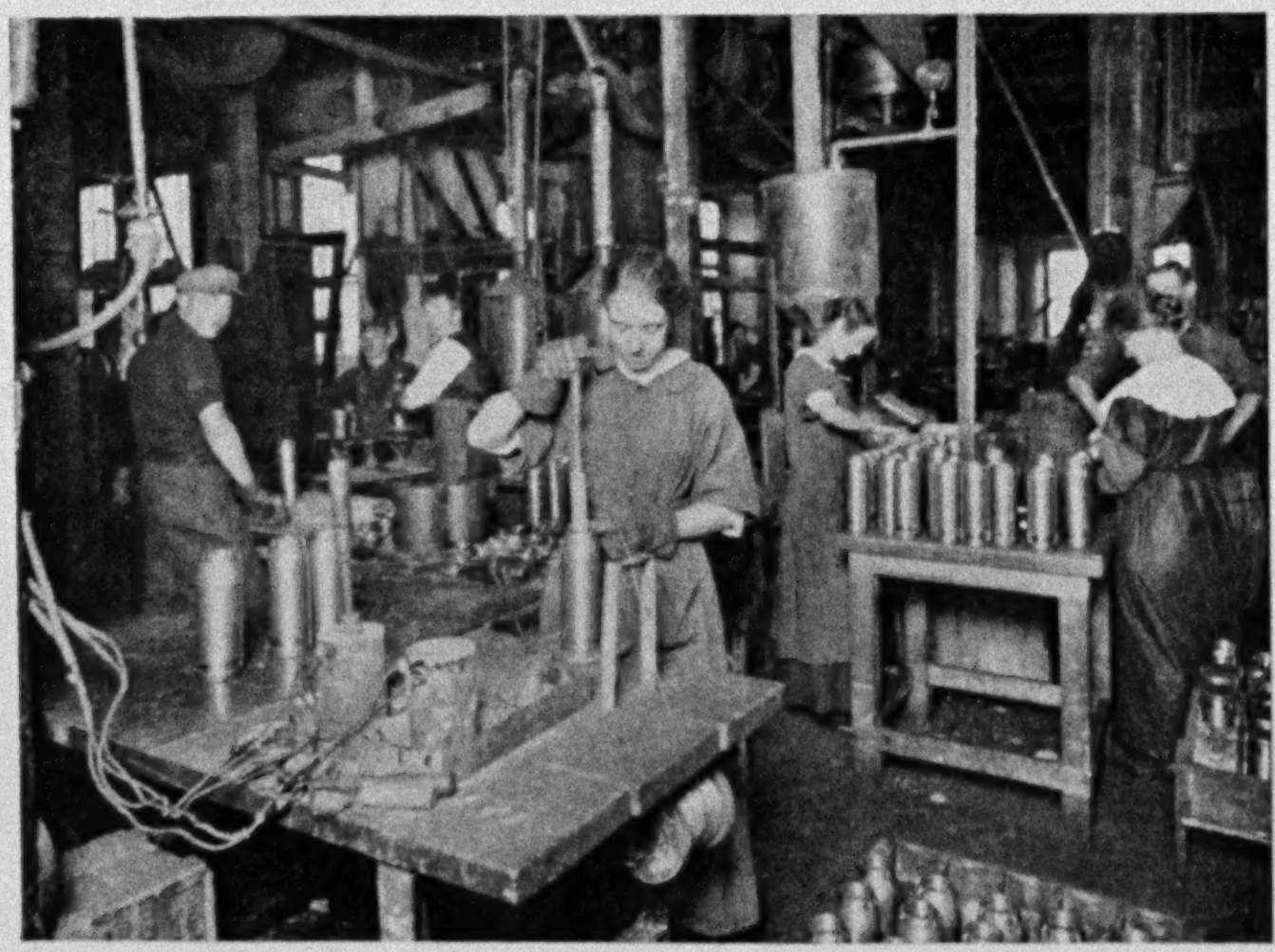
Here the foreman will probably show you the mine stable, with its well-fed horses and its sleek-coated mules; nor does he forget to call your attention to Jennie, the mine dog, with her little brood of puppies, as happy and as playful as if their eyes had first opened in the sunshine instead of under the glow of electric-light bulbs. And then you will want to see the pumps, for the water comes into the mines twelve times as fast as the coal goes out, flowing from a host of underground springs. To pump water day and night, winter in and summer out, at the rate of 10 tons a minute, is no Old Oaken Bucket job.

On top of the ground are the beehive coke ovens. Here all the volatile matter is burned out of the coal, usually in 48 hours' burning, and the carbon or coke is left behind. As the coal comes up the mine shaft it is dumped into a bin, out of which it flows by gravity into an endless chain of little cars which run along on top of the ovens and charge them. After an oven is charged with coal it is then sealed, except for a little aperture at the top of the door which regulates the burning process. When all the volatile matter has been burned out, the door is opened and a great mechanical scraper goes in and scrapes out the coke.

But the great war has taught the coke producer what a terrible waster of the nation's resources he has been. Twenty-eight per cent of every ton of coal put in a beehive oven goes up in odorous gases,

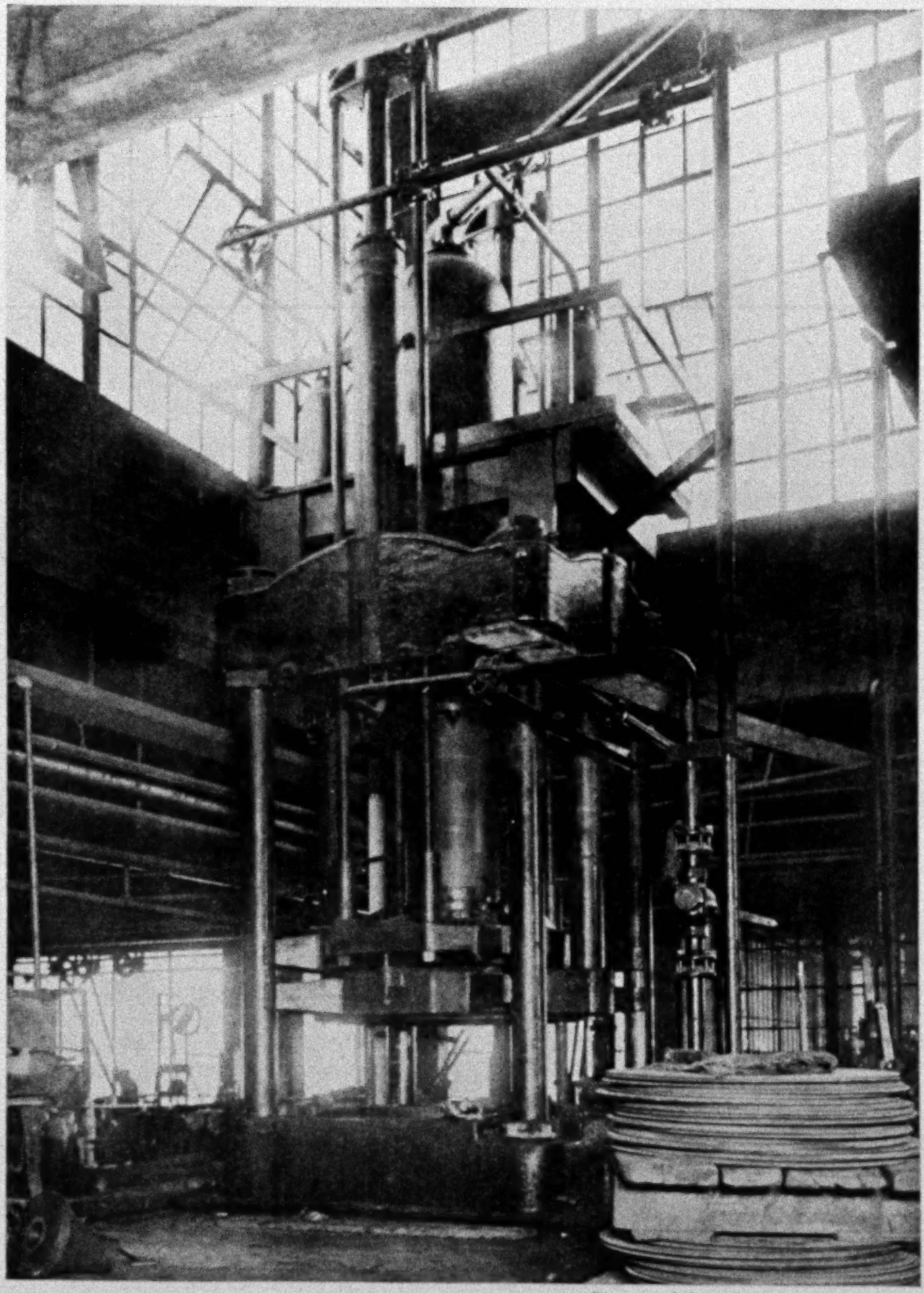


ROLLING BARS FOR SHRAPNEL STEEL AT A PENNSYLVANIA MILL



Photograph from Press Illustrating Service, Inc.

WOMEN DOING THEIR BIT IN AMERICAN MUNITION FACTORIES



Photograph from Prest-o-lite Company

A GIGANTIC PRESSURE PRESS FOR STAMPING CYLINDERS OUT OF STEEL PLATES AT ONE OPERATION

This industrial titan, one of the most powerful engines in the world, exerts a pressure of 800 tons upon a sixty-inch steel plate, converting it into a cup having a diameter of 42 inches, the thickness of the steel being one-fourth of an inch.

Photograph from Brown Brothers

THE FINISHING SECTION OF A BIG RAIL MILL

After the rails have been rolled and heat-treated, they are sawed into proper lengths and sent through a straightening department, where the holes for the fishplates are punched

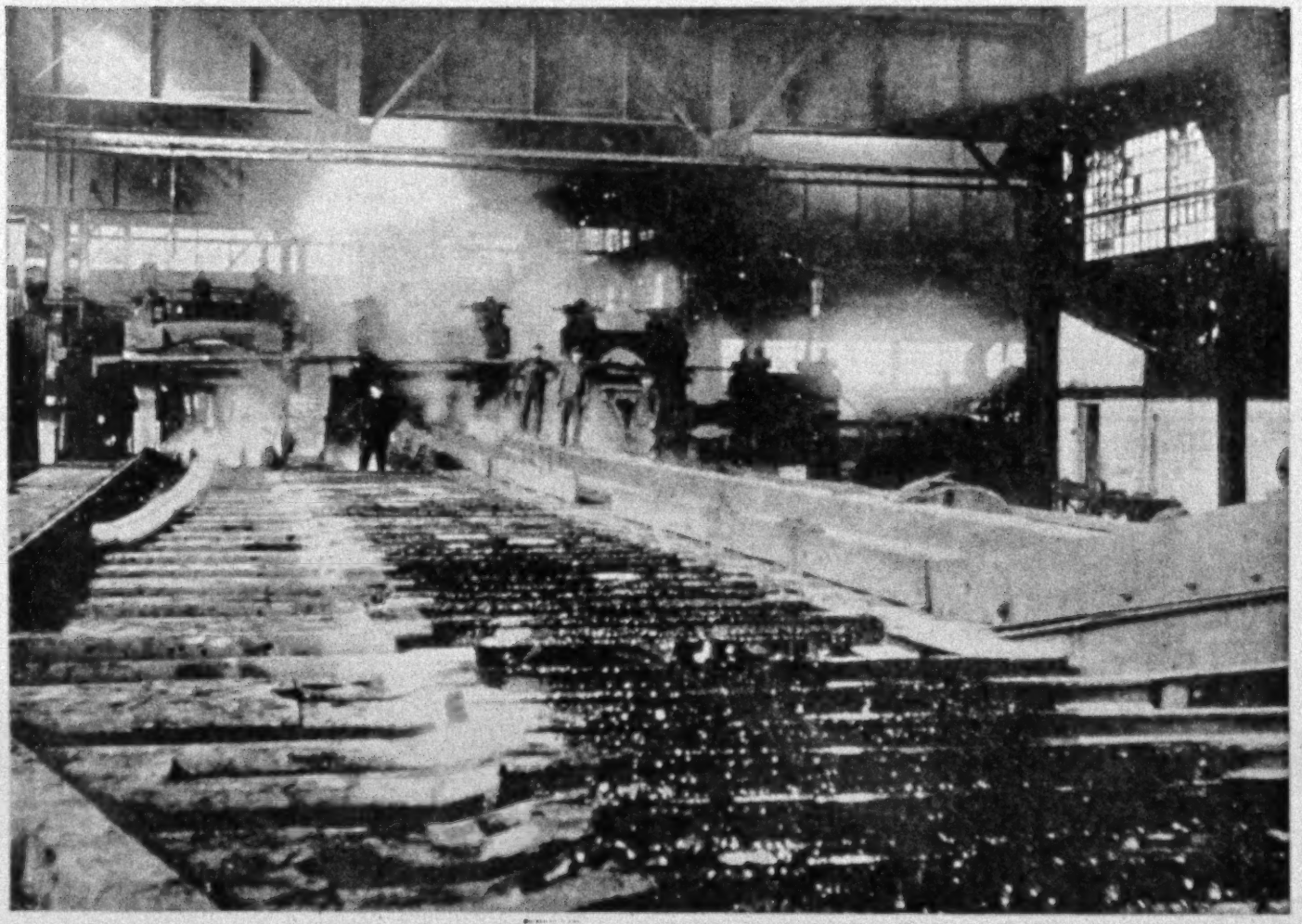
unregarded in former years, but immensely valuable to a world that desperately needs them. From a ton of coal there may be extracted five gallons of tar, 20 pounds of sulphate of ammonia, and from 1.1 to 3.7 gallons of benzol, with a small quantity of toluol, to say nothing of 10,000 cubic feet of gas.

In other words, the odors of the beehive coke oven, if properly handled, are worth, at current prices, from two to four dollars for every ton of coal—worth more indeed than the coal itself sold for before 1916. In addition to this wonderful saving, it was found that an improved type of oven, such as is necessary to save what would otherwise go up in smoke, produces 75 pounds of coke for every 100 pounds of coal, whereas the beehive oven gets only 65 pounds of coke out of each 100 of coal. It is estimated that in 1913 alone, a year of normal prices, the natural wealth that went up in smoke was approximately as great as the total earnings of all the workingmen engaged in the manufacture of automobiles and agricultural implements.

PROFITS FROM THE TAR-POT

The by-product coke oven overcomes all this. With 40,000,000 tons of coke required annually, and each ton representing a possible saving of materials now worth at least three dollars a ton, it will be seen what a boon the new type of oven is.

In making by-product coke the bituminous coal used is ground to a very fine grain. It is then dumped into the ovens, a battery of which may be said to resemble a series of giant lockers arranged side by side, about 12 feet tall, 37 feet in horizontal depth, and tapering in width from 18 inches at one side to 21 inches at the other. Great heating flues surround each oven and soon make the coal white hot, driving off all of the gases. These gases pass out through a pipe in which they are made to surrender the ammonia and tar they contain. About half of the gas, after being thus deprived of its load of tar and ammonia, is forced to return to the task of heating the oven for future charges of coal, while the other half is



Photograph from Brown Brothers

STEEL RAIL PASSING THROUGH A ROLLING MILL

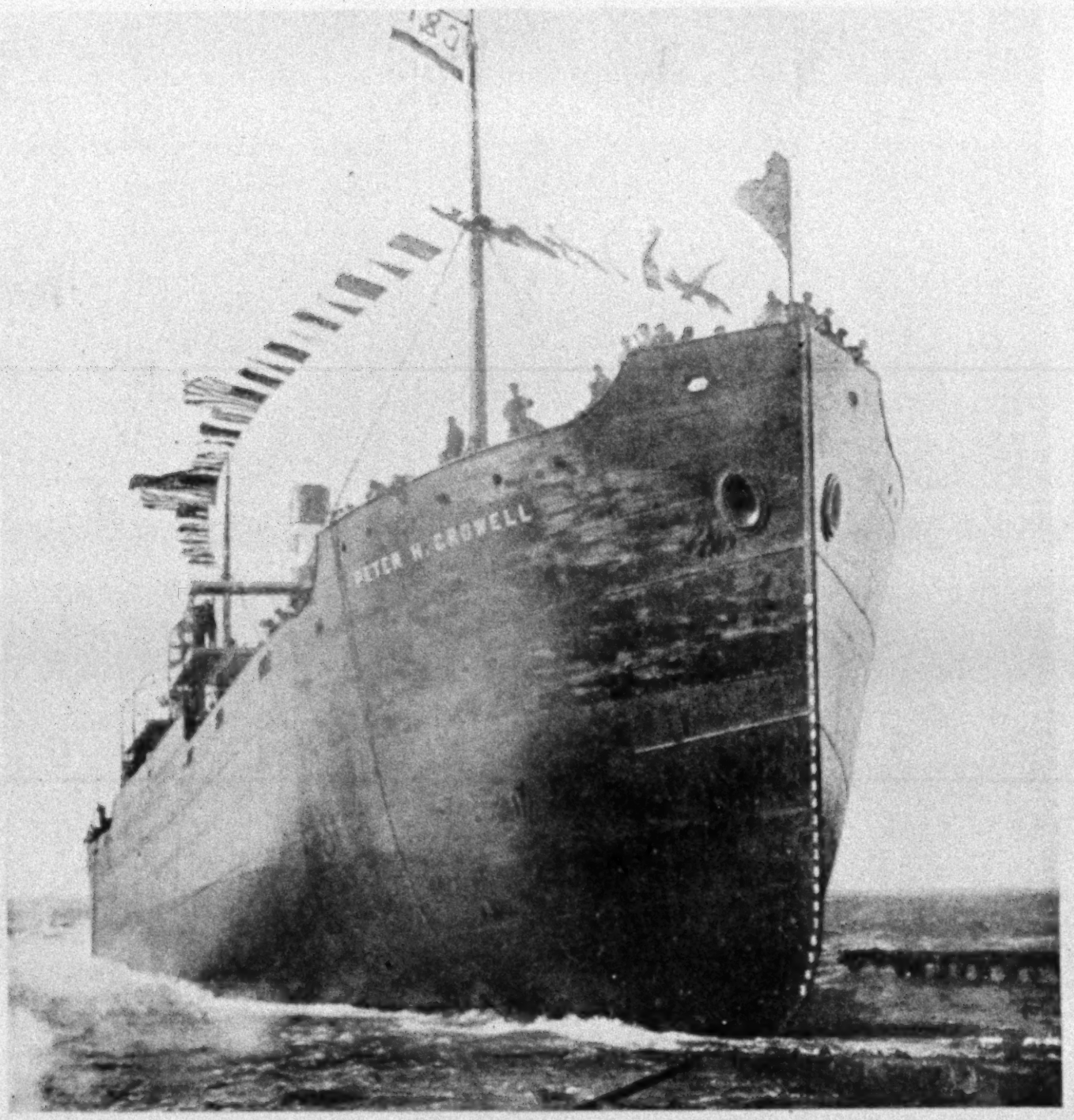
After the liquid steel has been poured into the ingot mold and has cooled sufficiently to become hard, the mold is slipped off, and a long-armed crane picks up the ingot and sets it down in a small pit, where it is heated for an hour and a half, so that it will become of uniform texture and hardness throughout. Then the temperature is raised and it is tempered to rolling-mill softness. Then the crane comes back and lifts it over on the bed of the mill. Trembling and writhing as if in anticipation of the stress it is about to endure, it plunges in between two big rollers, each a yard in diameter and ten feet long. Once it gets through these, it is long and slim, mayhap like a pancake, mayhap like a rod, mayhap like a bar. Again and again it goes through rollers of varying shapes, finally coming out either as a steel rail, a rod, or a plate, according to the shape of the roller and the number of rollings.

available for driving the blast engines of the furnace, illumination, etc.

When the coal has given off all its gases, a huge electric ram comes up, the door of the oven flies open, and the ram begins to push. On the other side of the oven another door swings open and out into a steel car the glowing carbon falls. An electric engine picks up the blazing load, and down the track it goes to the quenching station. Here, amid a great hissing and an immense cloud of steam, the coke is cooled down by a big stream. Then it is hauled away, dumped into a series of small bins, picked up in regulated quantities on an endless belt, and carried to a grader and screener. Thence it goes to the blast furnace, where it is mixed in proper proportions with limestone and ore, and the last process in pig-iron making begins.

How much the country may save in its natural resources is shown by the wonderful plant of the United States Steel Corporation at Gary, Ind. In a recent year more than a million tons of coal were saved—more indeed than is required to furnish light and heat and power for the nation's capital.

The third ingredient of the metallurgical wizard's boiling cauldron, the blast furnace, is limestone. Soul-mates and affinities there are a-plenty in the chemical world, but none more striking than limestone and the impurities in iron ore. The metallurgist knows the weakness of



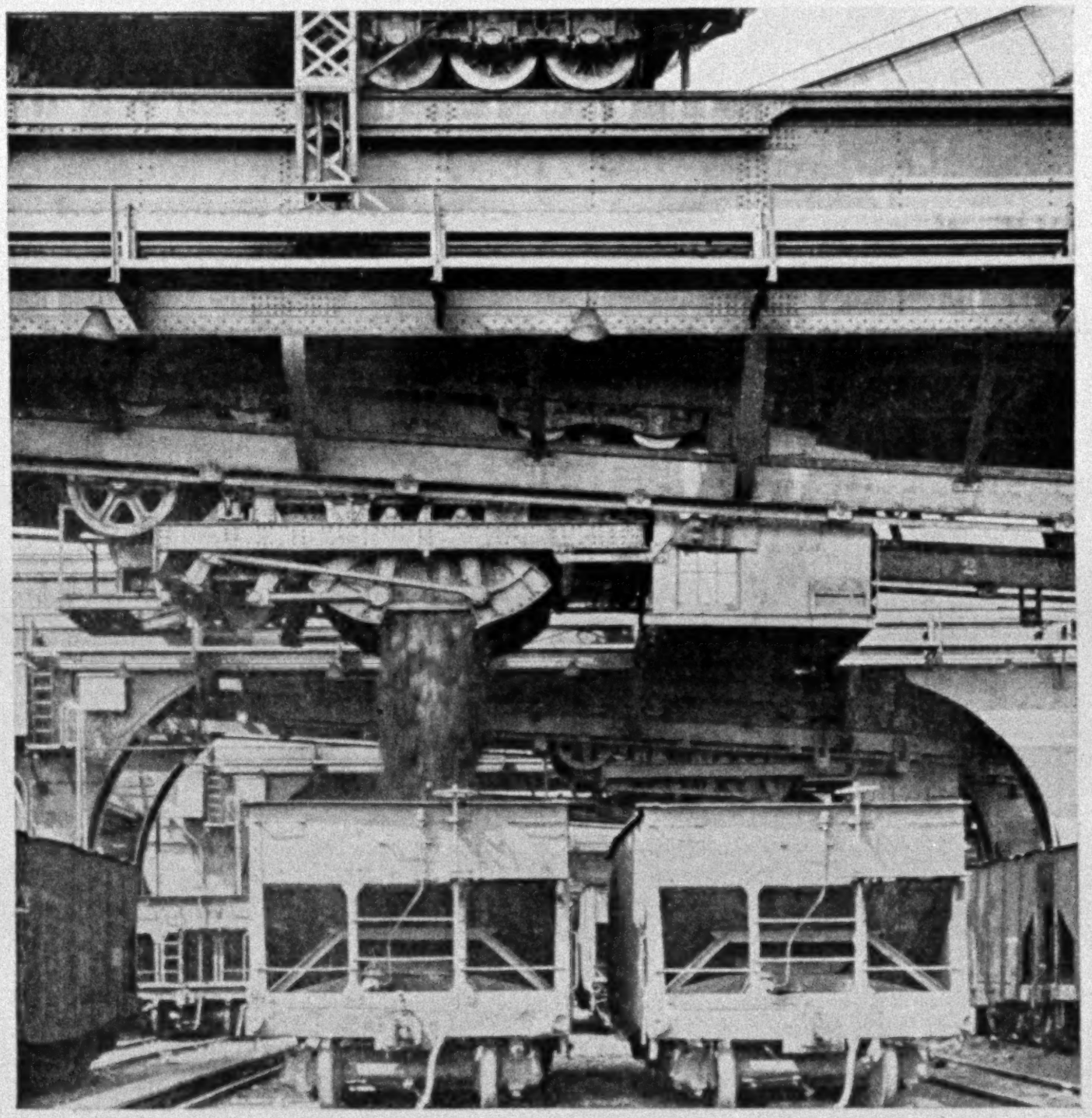
LAUNCHING A STEEL MERCHANTMAN AT NEWPORT NEWS, VIRGINIA

No war in history has had more "ifs" and "buts" about it than the one America is helping to wage today; and perhaps the most threatening is the submarine "if." Can America and her Allies turn out enough steel and wooden ships to counteract submarine destruction until the Allied armies are victorious in the field? American industry answers "Yes," and with the conviction that grows out of never yet having met a situation it was unable to master.

the bonds that bind the foreign materials in the ore to their companion iron when stressful times come. He knows that, given half a chance, they will find affinities and elope, and that's what he wants them to do; so in limestone he provides the affinities.

SOUL-MATES IN BLAST FURNACES

The modern blast furnace is a tremendous and spectacular institution. At the top it takes in coke and ore and limestone and turns loose two streams of molten material at the base. It is a large circular, silo-shaped affair, some 90 feet high, kept going day and night, Sunday and Christmas alike, year in and year out, when it does not give way under the strain. The coke, limestone, and ore are mixed in proper proportions and carried up to the top of the stack and dumped in. Down at the bottom of the furnace a tremendous air blast is driven in by huge engines, under a pressure of as much as

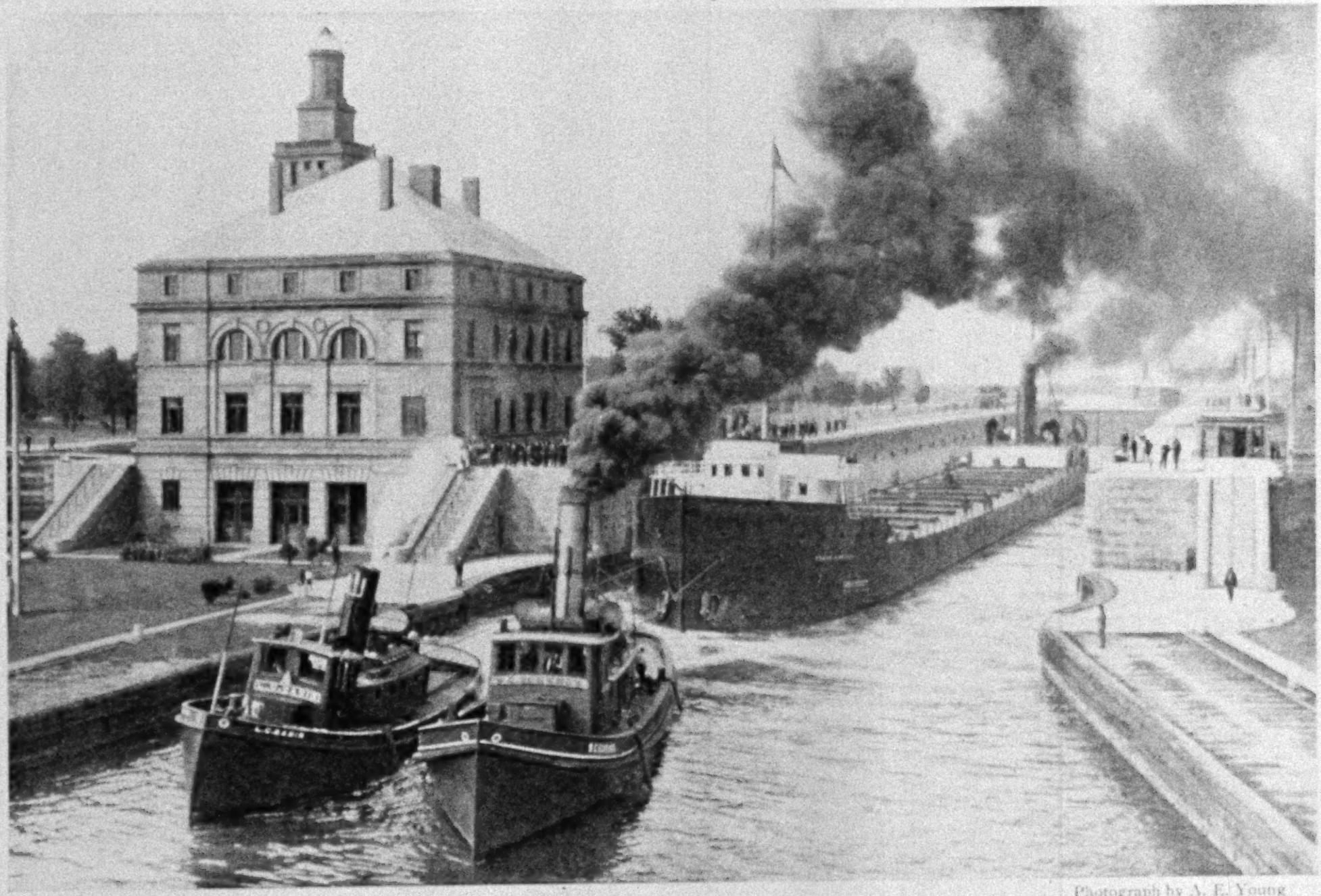


LOADING ORE INTO CARS AT ASHTABULA, OHIO

The most massive ore-handling machinery in the world is in use at this great lower lake port. Here come untold millions of tons of ore to be transhipped to Pittsburgh, Youngstown, and other blast furnace points. The big Hulett unloader dumps its burden into a bin almost as soon as it is out of the hatchway. While it is diving down into the hold for another load, the bin, which is mounted on wheels, moves away and dumps its contents into waiting cars, as seen in the picture. By the time another mouthful is ready the bin is back to receive it. The cars are standing under the rear end of the unloader, as that big mechanism is seen in the picture on page 134.

16 pounds to the square inch. A veritable inferno results, and the blast causes all the oxygen in the air to unite with the carbon and leave through the gas pipes.

The ore and the limestone melt under the ordeal and the foreign matter in the ore unites at once with the molten limestone. Being lighter than liquid iron, these newly wedded soul-mates rise to the top of the bubbling cauldron as oil rises to the top of water or cream to the top of milk. There are two holes in the lower part of the furnace. Out of the upper one of these, when tapped, come the affinities, now liquid slag, which soon hardens and is shipped away to be made into prosaic cement.

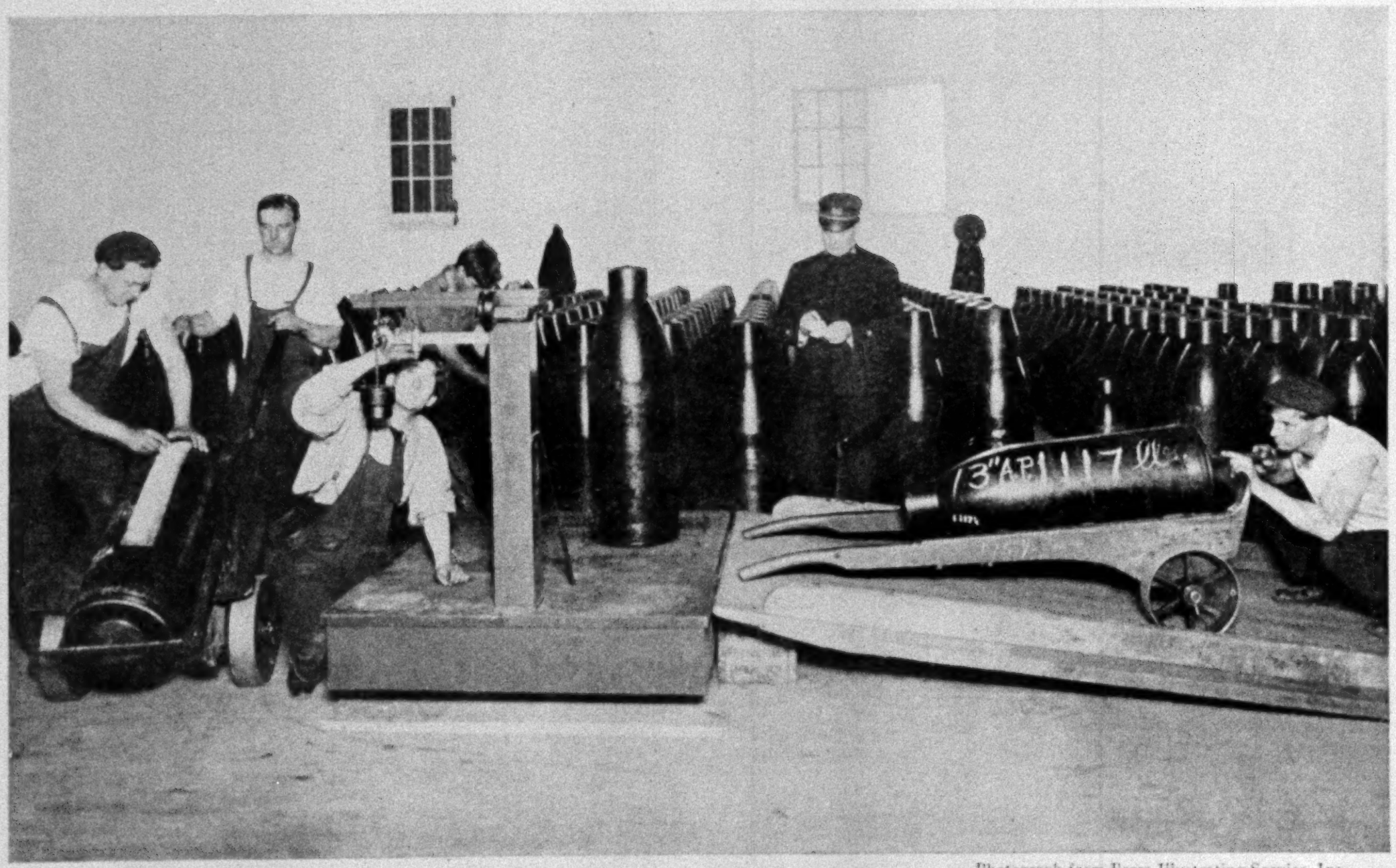


Photograph by A. E. Young

PULLING AN ORE STEAMER OUT OF POE LOCK: SOO CANAL

At Panama steamers are moved by electric towing engines operating on tracks on the lock walls. At the Soo Canal tugs perform this towing service when it is needed. Note the big lake passenger ships approaching in the background.

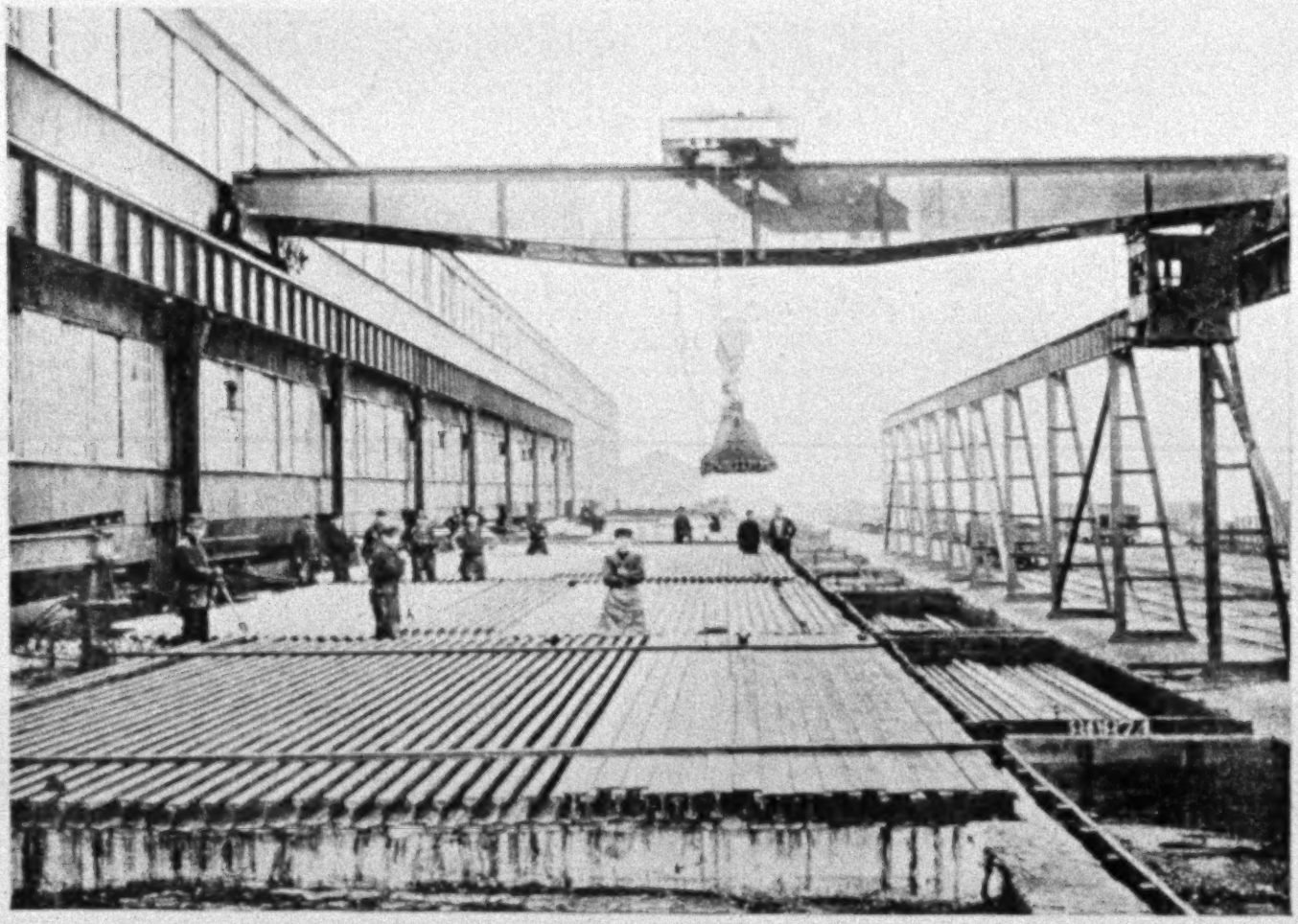
XUM



Photograph from Press Illustrating Service, Inc.

CHECKING AND WEIGHING SHELLS FOR THE EUROPEAN BATTLEFRONT

The demands of shell manufacture are very exacting. A variance of weight of only 1 per cent or so is allowed. The shells have to undergo from 30 to 50 operations, varying with factories, from the time the rough forging is received until the finished shell is turned out.



Photograph from Brown Brothers

LOADING STEEL RAILS IN CARS, USING AN ELECTRO-MAGNET CRANE

Feeding a blast furnace is no small job, measured by the material it has to have. Every day it wants about 800 tons of ore, 400 tons of coke, and 100 tons of limestone. But its reward to the feeders is about 400 tons of pig iron. It takes an enormous amount of air to make the furnace hum fast enough, some 37,500 cubic feet a minute at Gary. The big stoves of the furnace are of checker-like construction, resembling the radiator of an automobile. They are brought to an intense heat, and the air is then passed through their white-hot interstices before it reaches the materials to be melted. Here it makes the coke burn like "blue blazes."

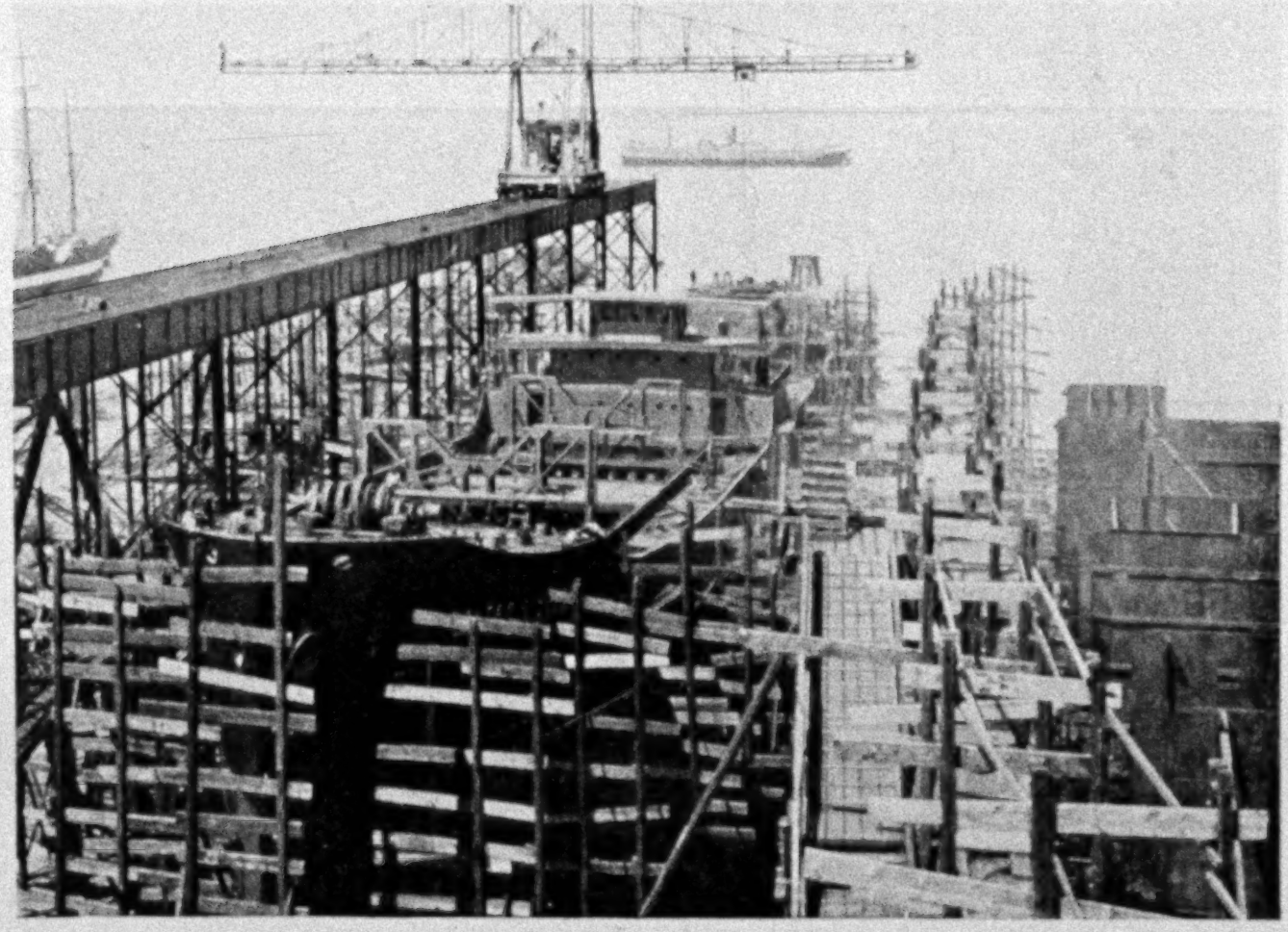
The coke now gives off vast new supplies of gas, part of which in turn comes back to heat the stoves, part to drive the big blowing engines, and another part to drive the dynamos which make electricity for operating the machinery of a great steel plant, in the case of Gary.

Running a blast furnace is indeed an exact science. The whole furnace must be water-cooled like an automobile engine, lest even the fire-brick give way under fervent heat. The rule of thumb doesn't go. Exact weights, measures, analyses, are necessary. If the slag is too acid, it will leave poor pig iron behind; if it is too limy, it will refuse to melt properly and cause "scaffolding." A classic illustration among iron men of what the rule of thumb results in is the story of the manager who got too little silica and too much limestone in his mixture and the owners lost $2,000 while he "thawed out" the "frozen" mass in his furnace, as they say in pig-iron parlance when the stuff refuses to melt.

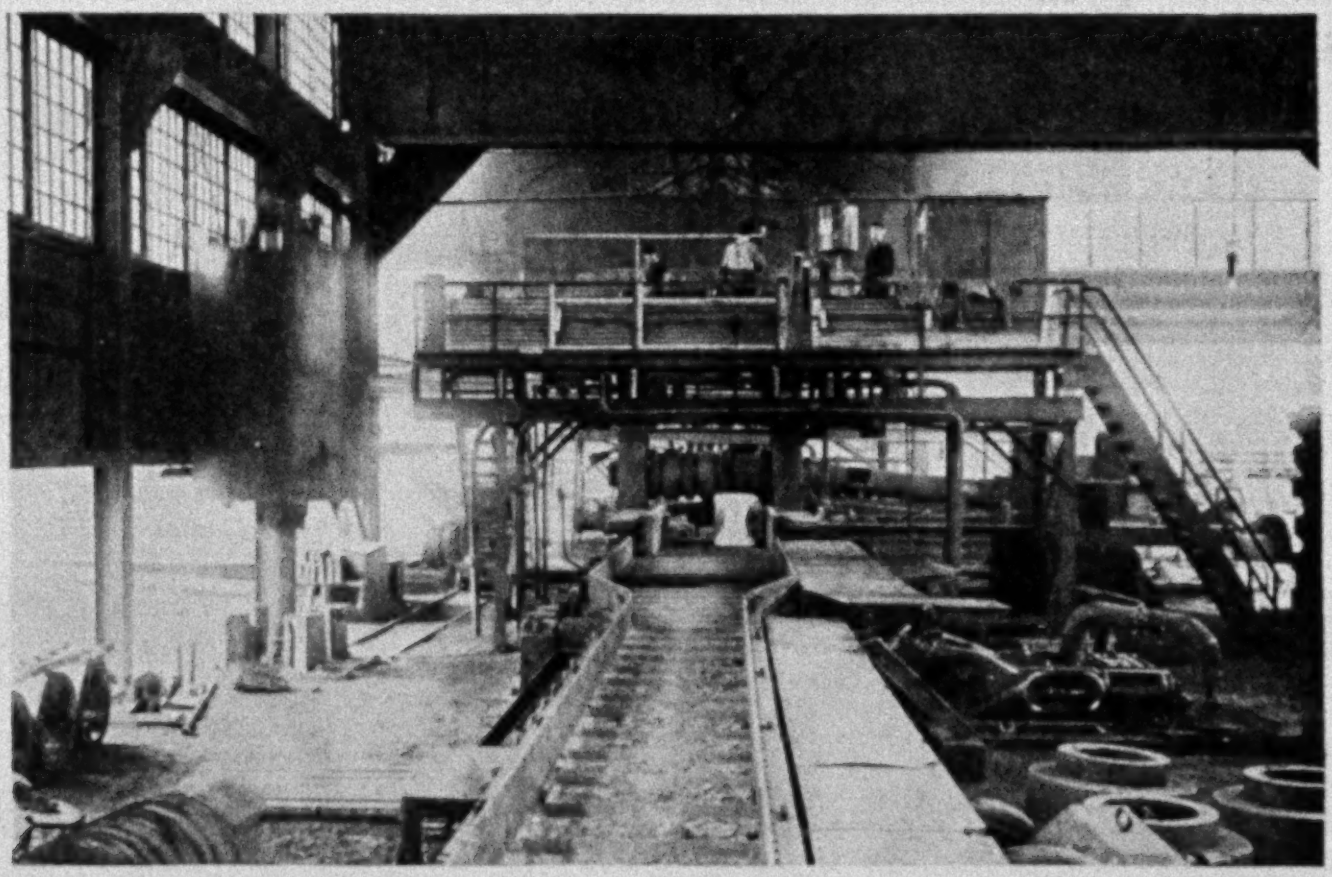
Unless the materials are carefully mixed, they will form a "scaffold" as they pass down from the top to the bottom of the furnace and while in the process of changing from solids to liquids under the spell of the heat. Once scaffolding starts, it is in danger of reaching clear across the shaft and damming up the downward flow of the materials or of "slipping"—that is, breaking loose at an inopportune moment.

IRON THAT FLOWS LIKE MILK

When the iron, now as liquid as milk, is drawn off, it is pig iron, although under modern practice it may never see a pig mold at all. At some furnaces it is still

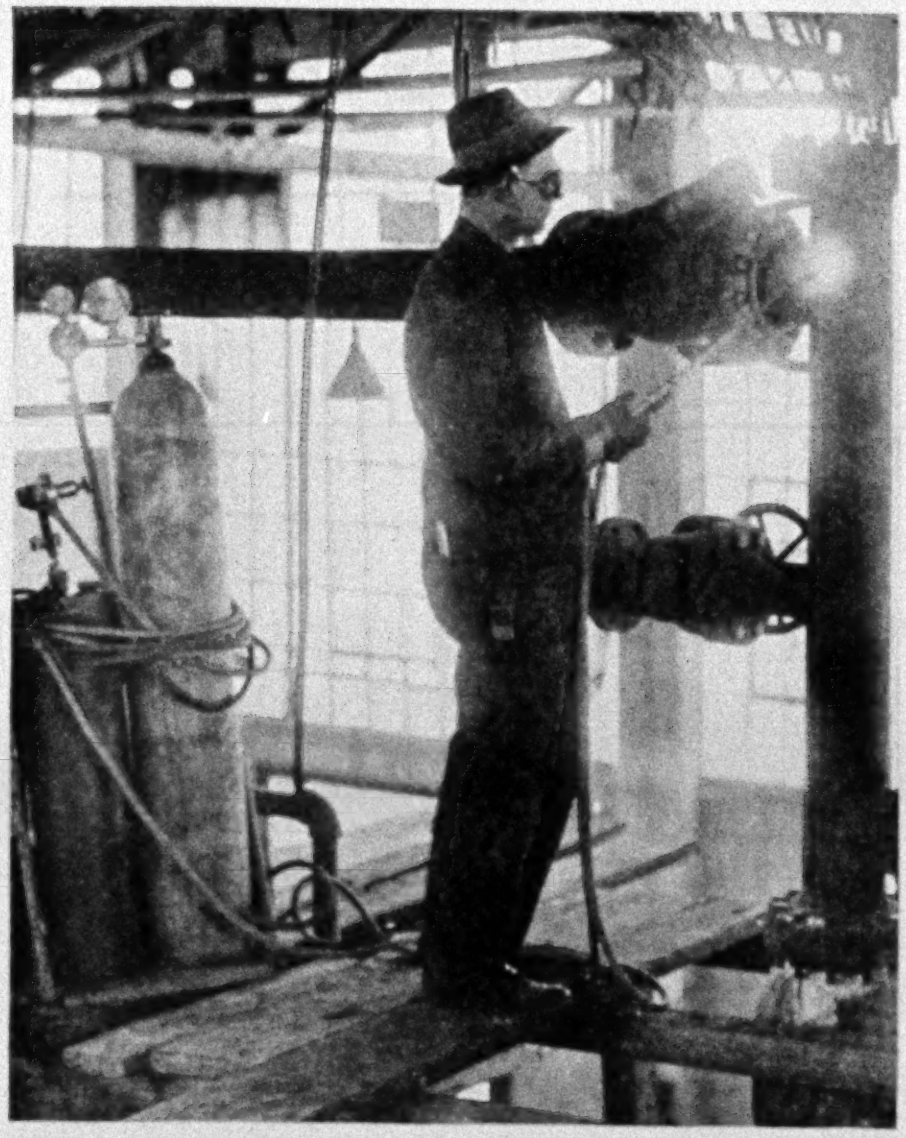


SCAFFOLDING AROUND A SHIP UNDER CONSTRUCTION AT NEWPORT NEWS



ROLLING STRUCTURAL STEEL AT BETHLEHEM, PENNSYLVANIA

There are two cross-roads in the steel industry. All roads lead from the raw materials to pig iron. Thence they branch out again to the puddling furnace, the open-hearth furnace, the crucible furnace, etc. Then they converge again to the ingot, only to branch out once more into the infinite variety of products of the roller mill. Pig iron has often been called the common denominator of the iron industry, and the ingot the parent of all wrought steel. Out of such mills as this will come the structural beams for the shipping that may decide the issues of the world war.



Photograph from Prest-o-lite Company

THE OXY-ACETYLENE TORCH WELDS AND CUTS ALL METALS WITH EQUAL FACILITY

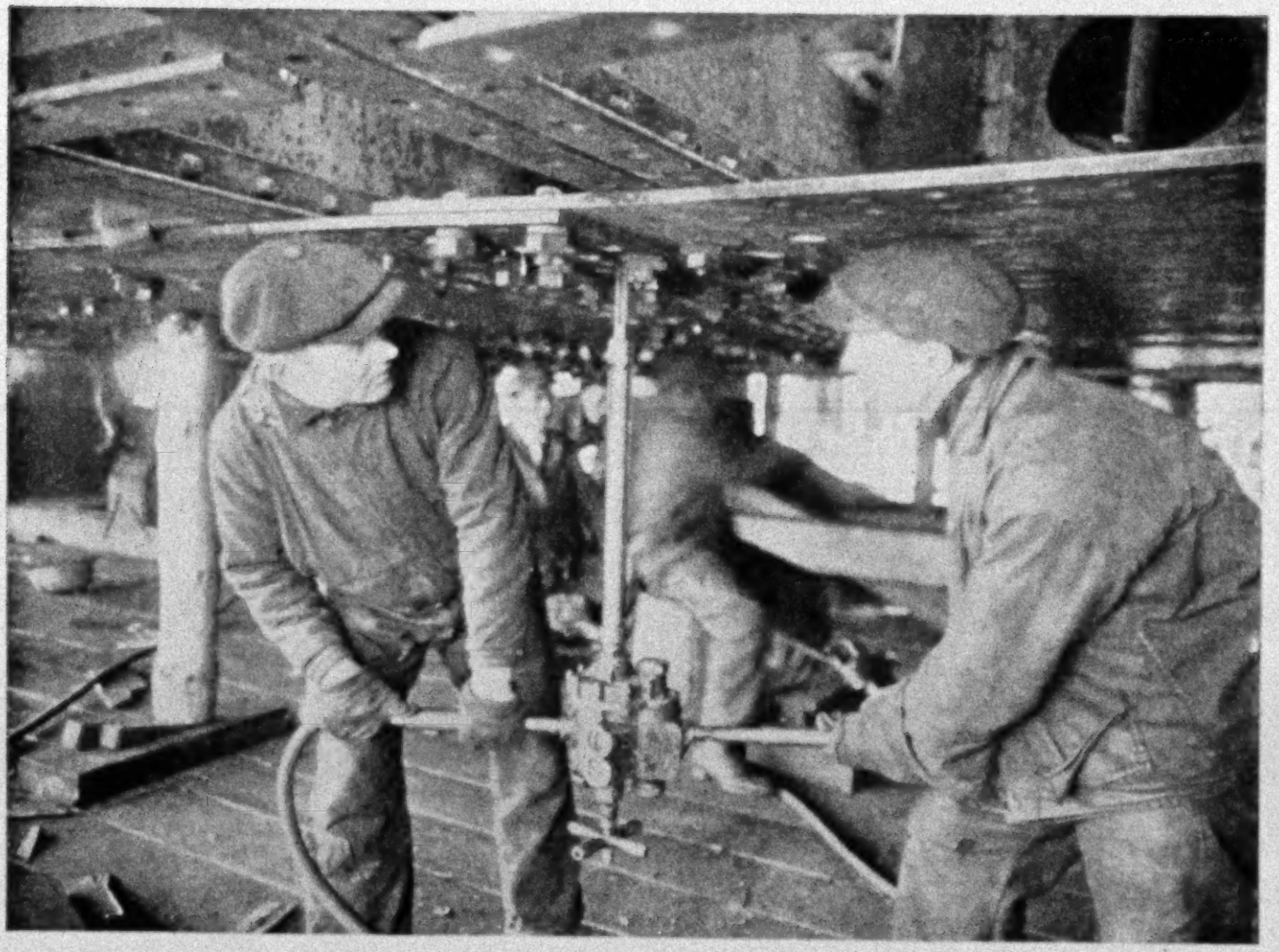
It is proving an important factor in rebuilding tools and machinery at a time when every pound of steel and iron is precious to the nation. As the hair of the dog is good for the bite, so the heat of the oxy-acetylene torch is good for its burn. When the officers in command of the interned German ships realized that their vessels were to be taken over by the United States Government, great sections of the cylinders were cut out with the powerful acetylene torch, in the expectation that the machinery would thus be hopelessly damaged. But Yankee ingenuity has employed this same torch, which develops more than six thousand degrees of heat, to weld the damaged parts, making them as strong as new. Precious months of time, hundreds of thousands of dollars, and thousands of tons of shipping have thus been saved to America.

drawn off into large cavities in sand, called "sows," and then conducted to smaller ones, called "pigs," where it is allowed to cool and harden. In others it is drawn off into metallic molds. An advance over these two methods is the machine caster. Here it is drawn off into huge ladles, some of them holding more than a carload of metal, and mixed like milk in a homogenizer. Then it is drawn off into molds mounted on an endless belt, which runs through water that cools the pigs as they pass. From the water they pass on to the pulley around which the belt turns and are dropped into the waiting railroad car, no man's hand touching the iron from the time it leaves its place in the ore bed until it is in the freight car ready for its ride to the steel mill.

In some cases, where pennies in the matter of unit costs are carefully counted, the furnace and the steel mill are in the same plant, and the pig iron is delivered in its molten condition directly to the steel-maker. But though it may never become pig, it is always known as pig just the same.

We have now followed in bold outline, and without too much attention to detail or to variations, the story of the iron industry from the imbedded ore and the unmined coal down to the last stage of pig-iron production. Up to this point all things steel have a common history. Pig iron is the common denominator of every fraction of the steel industry. Up to this point the great 200-ton casting for a powerful electric dynamo and the tiny hair-spring for the highest grade watch, the powerful 16-inch gun that weighs as much as a locomotive and the microscopic screw with threads that elude the human vision, the death-dealing shell and the peaceful plow, all come the same road. Ore bought of the land-owner at 25 cents a ton is worth $7,000,000 a ton as fine watch springs.

But once out of the blast furnace pig iron comes to the parting of the ways,



Photograph from Press Illustrating Service, Inc.

REAMING OUT RIVET HOLES WITH COMPRESSED-AIR MACHINE

The world uses sixty times as much iron and steel today as it used during the Napoleonic wars. There wasn't a mile of railroad, a foot of steel bridging, a building of structural steel, a farm implement more complicated than a grain cradle in all the world when Napoleon surrendered his dream of empire at Waterloo. And yet those best able to judge believe the hundred years to follow the present war will mark more human progress than the amazing century that followed Bonaparte's downfall.

Some of it will go to the puddling furnace and become wrought iron; some will take the cupola route and become cast iron; much more will go into the Bessemer converter and become soft, malleable steel; but more still will take the path that leads to the open-hearth furnace. A little, comparatively speaking, remains behind, finds its way into a crucible furnace or an electric furnace, and becomes the tool steel of the industrial world.

KNEADING IRON LIKE DOUGH

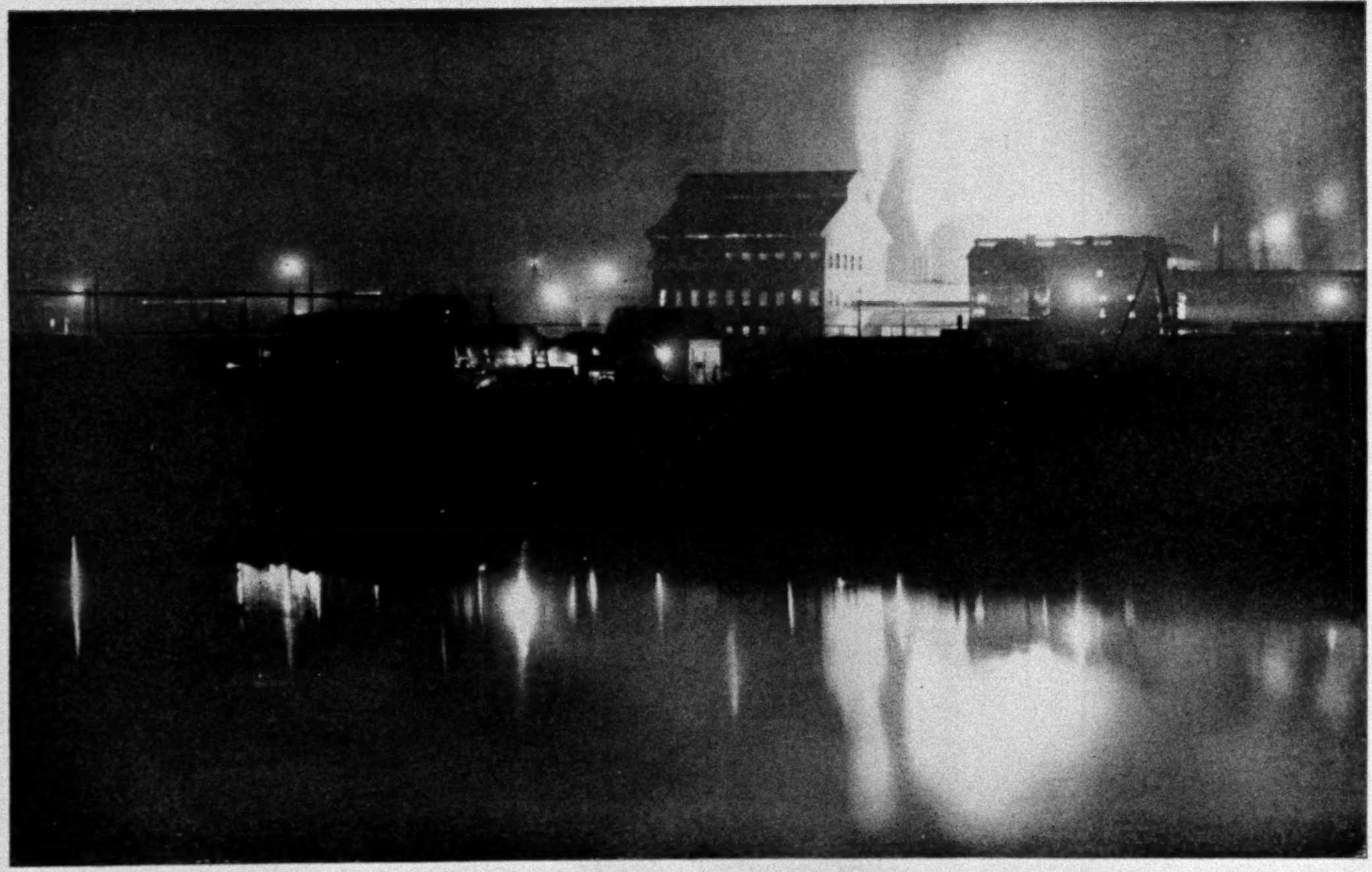
In making wrought iron, used generally in the manufacture of chains, pipe, grills, bolts, nuts, and the like, about 560 pounds of pig iron is heated until it reaches the consistency of dough. Slag soon begins to form, and, being lighter and more fusible than the pure iron, floats to the top and the greater portion is poured off. At this stage the iron begins to form into small pasty globules, about the size of a pea, each globule surrounded by a thin covering of fluid slag.

Stripped to the waist, with arms and muscles like those of a prize fighter, the puddler for nearly an hour and a half is stirring or "puddling" the iron. He takes a bar of iron, known as a rabbling bar, which in itself would make a load for most men, puts one end through the furnace door, and turns the pigs until melted, stirring the mass so as to expose all parts of it to the action of the overhead flame until the impurities are largely eliminated. The iron is then formed into two or three pasty balls, which are taken out of the furnace dripping with slag and conveyed by means of tongs to the "squeezer," where most of the remaining slag is pressed out.

It is a strange thing about iron that

THE BRITISH STEAMER "BRITANNIC" JUST AFTER LAUNCHING

This steel palace afloat, built to carry the peaceful tourist invaders of Europe and America across the Atlantic, now lies at the bottom of the Mediterranean Sea, a victim of the ghastliest aspect of the world war—the torpedoing of hospital ships. Note the streaks of white in the foreground; they are formed by the tallow melted by the heat generated as the leviathan slid down the well-greased ways and buried her keel beneath the waves



INDUSTRY BEHIND THE WAR: PITTSBURGH AT NIGHT

The great purification processes of the blast furnace and the steel plant are symbolical of the better international spirit the world prays will grow out of the fiery furnace of suffering in this Armageddon of history

Photograph from Brown Brothers

BUILDING FARM TRACTORS AT MINNEAPOLIS, MINNESOTA

As population at home grows more dense and demands abroad multiply, steel as a labor and food saver on the farm becomes of greater importance. When the farm tractor generally replaces the horse, it will release about 100,000,000 acres of farming land for other purposes, as it requires the products of about five acres to maintain a work horse. This totals nearly twice the area devoted to wheat growing in the United States in these dire times when the whole world is begging us for bread.

with treatment it may be given almost any degree of hardness after the heat has left it, from the soft, weak iron casting to the hard, strong tool steel. It may also be given any color from silver white to coal black. Cast iron is different from steel in hardness and in color. It can stand almost as much squeezing together as the best steel, but it is comparatively weak in resisting a pull apart. It can stand a steady strain, but a sharp blow will shatter it. In making cast iron the cupola furnace is usually used, but not always. A bed of coke is laid down, then a layer of iron, then another layer of coke, and so on. It is then fired, the iron melts and runs out, and is poured into molds. Air-brake parts, radiators, pipe fittings, etc., are examples of the uses of cast iron.

The story of Bessemer steel is one of the fascinating chronicles of the industrial world. It seems to have been one of those cases where two men working in different countries, each without knowledge of what the other was doing, reached the same conclusion about the same time. Both were granted American patents; but upon application for renewal, the Patent Office held Kelly to be the inventor. The world, however, gives the credit to Bessemer, and the process is known as the Bessemer process.

Kelly was a maker of old-fashioned cooking pots and kettles. It is related that one day he was sitting in front of his furnace and observed a point of incandescence where there was no charcoal—only the metal and the air. This led him to contend that air alone would burn out the impurities from molten iron. When he developed his tilting converter, his engineer blew such a tremendous blast through the first charge that iron and all went up as sparks, to his discomfiture and the crowd's amuse-

ment. He finally succeeded in getting the amount of air regulated, and poured out of his converter the first Bessemer steel. People said Kelly would soon be burning ice. Since his old converter was first used, billions of dollars' worth of steel has flowed out of the world's converters.

DANTE'S DREAMS OUTDONE

Both Kelly and Bessemer were baffled by the problem of regulating the supply of air so that it would not burn out all the carbon, a little of which is essential to steel. Furthermore, their products frequently proved to be brittle, owing to the fact that the molten metal absorbed oxygen from the air blast. The first difficulty was solved eventually by the expedient of burning out practically all the carbon, then adding exactly the amount required for the specific quality of steel desired. The second difficulty was overcome through the addition of manganese to take care of the hurtful oxygen. The latter suggestion was the contribution of Robert F Mushet, a Scotch steel maker. Goransson, a Swedish ironmaster, had previously achieved the same results by using a pig iron initially rich in manganese. Thereafter underdone and overdone steel disappeared.

To go into a great building where there is a battery of Bessemer converters is to see more heat than Dante ever pictured. A converter is a huge egg swung "amidships" on trunnions. The great egg of steel lined with fire-brick has the top off. Some twenty tons of molten pig are poured into it, and then through some two hundred little holes in the bottom powerful engines pump in a stream of cold air. As the oxygen-laden air sweeps up through the molten iron, it touches the molten carbon and silicon, which constitute the impurities, and carries them away. Millions of red and white sparks fill the air, as if some demon within the fiery fluid were giving a pyrotechnic performance. A thousand engines, with safety-valves hissing under tremendous pressure, have the voice of a zephyr in comparison. First the flame that pours forth is violet, then shades into orange, becomes a dazzling white, burning finally to a faint blue, which is a sign that all the impurities are gone.

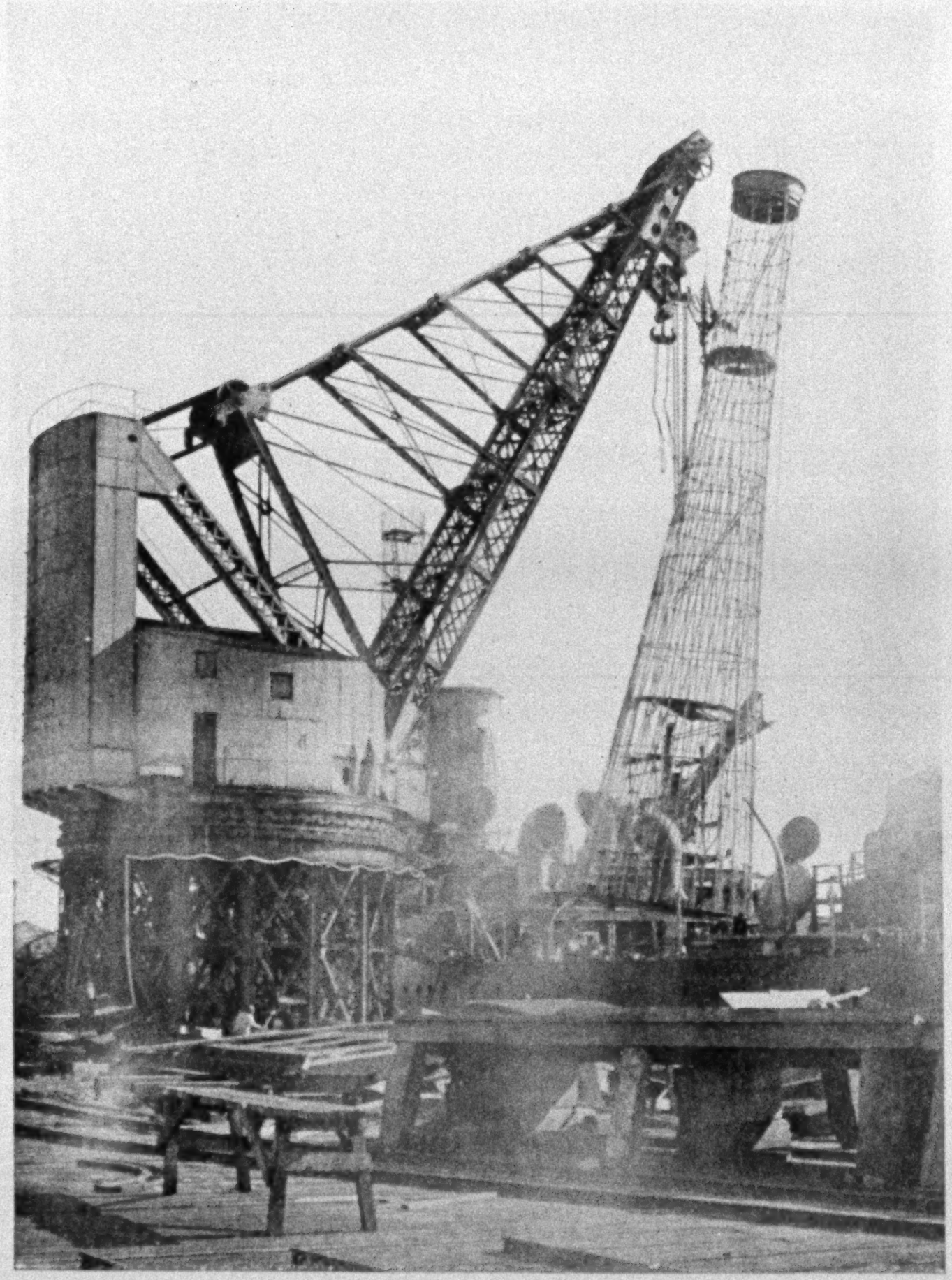
Then the blast ceases, the carbon that is necessary to replace the needed portions burnt out is added, the great brick and steel egg swings back to position, the carbon is mixed with the fervent fluid, and then the egg tips over on its side, and out of the top flows the liquid steel into a great ladle. When it is swung back into position, a man with colored glasses walks out over the converter and peers down into its white-hot depths to see if the heat from the last charge has melted away any of the fire-brick lining. If it has, he hurls balls of putty-like clay down into the holes to stop them up, or sets a crew of workmen to patching the damaged shell. This done, the big egg swings back again, gets another charge of molten iron, and begins the process over again. The whole operation takes about 20 minutes—a ton of steel a minute. Bessemer steel is used for structural material, railroad rails, wire, and pipe.

In 1900 there was twice as much steel produced in the United States by the Bessemer as by the open-hearth process. But with the rapid exhaustion of ores having the proper amounts of phosphorus for converter practice, the open-hearth furnace, which can use with equal success ores which contain either a large or a small amount of phosphorus, largely replaced the Bessemer converter.

A TINTED POOL OF LIGHT

An open-hearth furnace looks a good deal like an ordinary bake-oven; but when one looks in through the water-cooled door, a vast difference appears. Instead of pans of fragrant, fat loaves of baking bread, there is an imposing pool of fiery liquid as bright as the filament of a high-power tungsten lamp, so dazzling that it can be examined with safety to the eyes only by those using colored glasses. Tinted here and there with streaks of soft blue and dainty pink, it looks like melted stick candy.

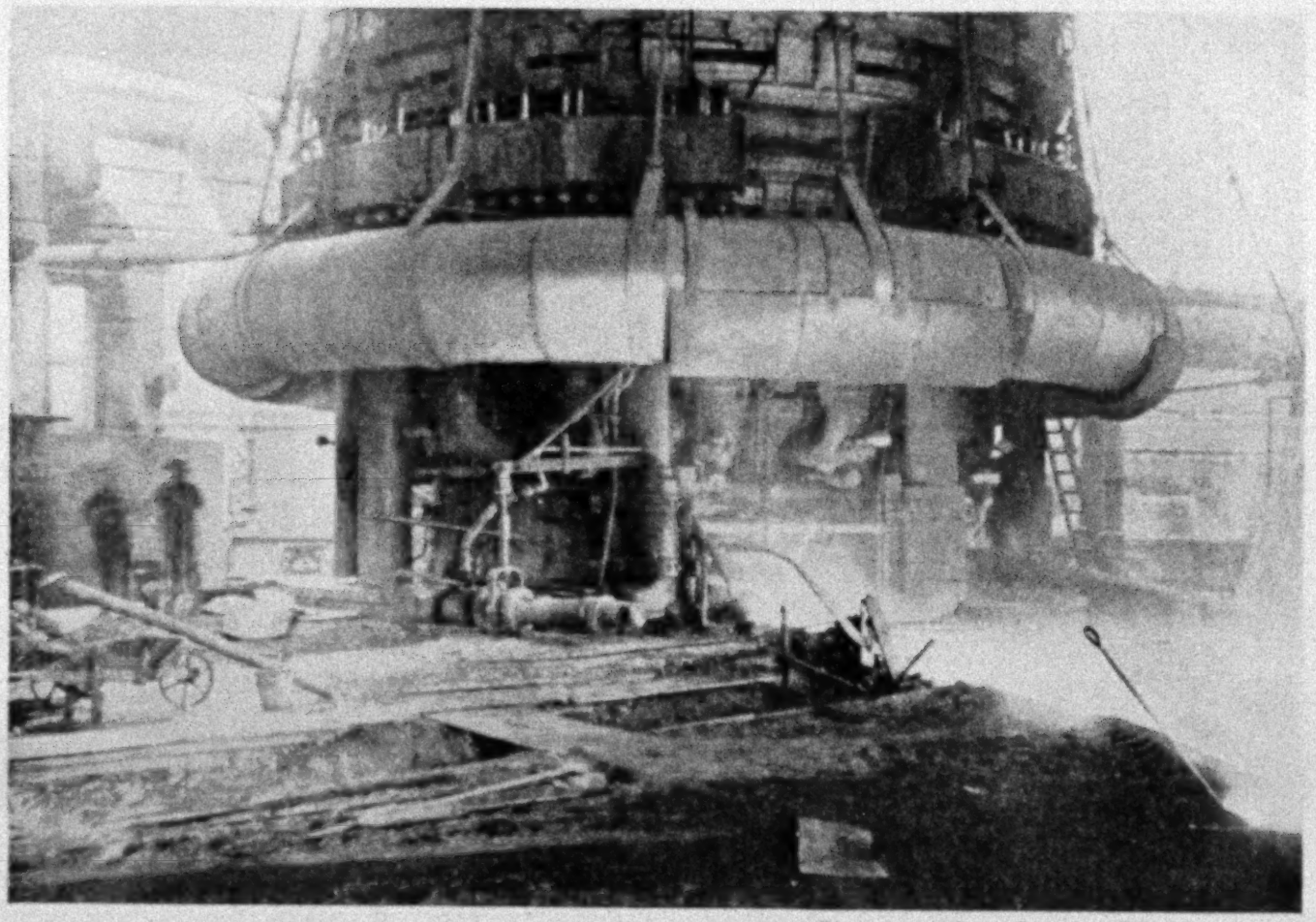
In preparing a battery of open-hearth furnaces for a charge, finely ground dolomite is shoveled in first. This melts like glass and fills up all cracks and crannies caused by the powerful heat of the



Photograph by E. P. Griffith

A GIANT CRANE SETTING UP A FIGHTING MAST ON THE DECK OF A BATTLESHIP

Lifting 150 tons with the ease of a farmer "shouldering" a bag of wheat, these big electric cranes will do their bit in combatting the German submarine by making it possible to speed up the capacity of every shipbuilding plant in America.



Photograph from Carnegie Steel Company

GIANT BLAST FURNACE, SHOWING A PORTION OF THE APPARATUS WHICH SUPPLIES THE FORCED DRAFT

The modern blast furnace is a tremendous and spectacular institution. At the top it takes in coke and ore and limestones and turns loose two streams of molten material at the base. It is a large, circular, silo-shaped affair, some 90 feet high, kept going day and night, Sunday and Christmas alike, year in and year out, when it does not give way under the strain.

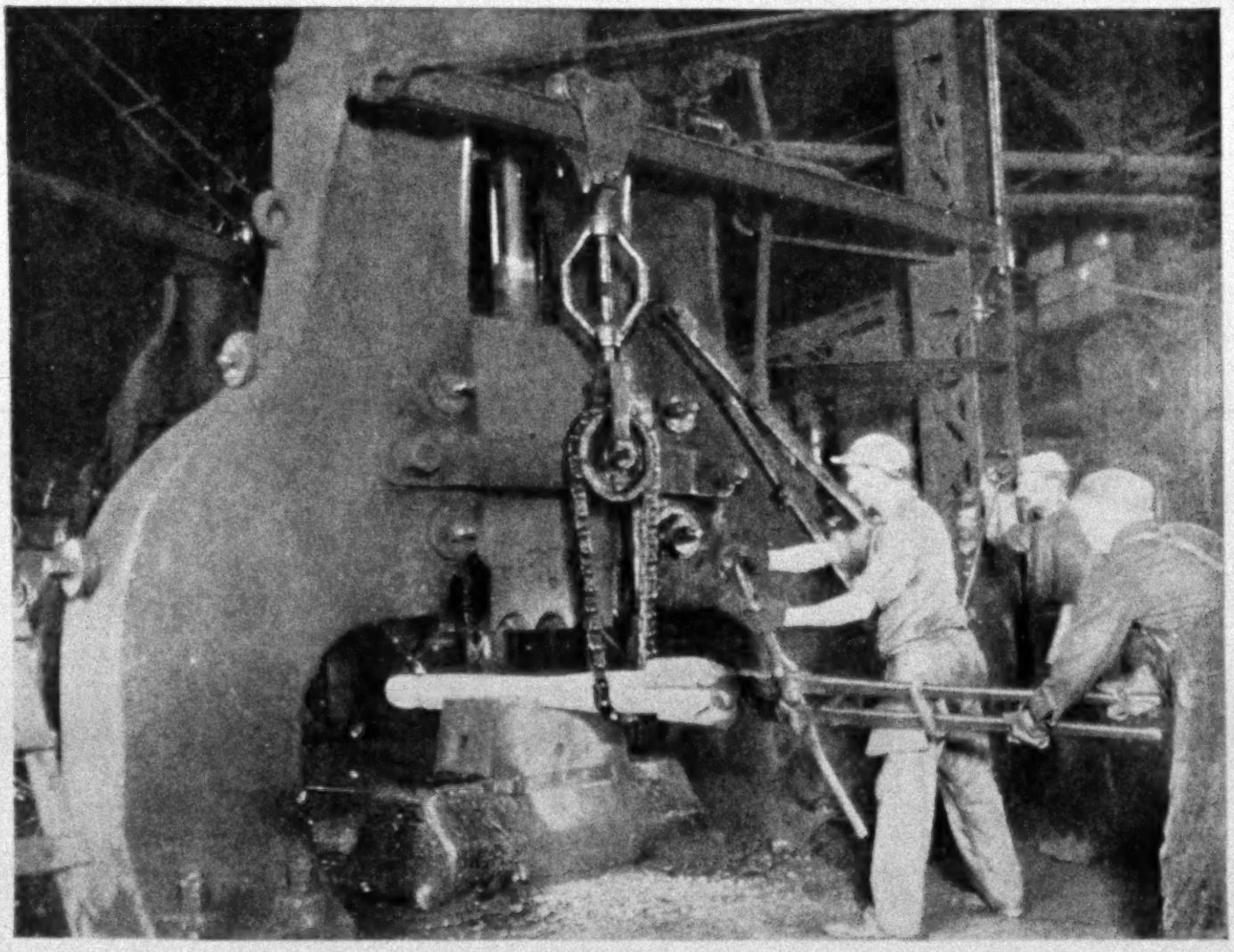
preceding charge. Then a little train rolls up before the battery, and an electric crane dumps box after box of scrap metal from the cars into the furnaces. Off some distance is a great steel tank lined with fire-brick and full of liquid pig metal.

This big tank is called a mixer, and in it hundreds of tons of the flowing, glowing iron are mixed. Thus homogenized, the contents of the mixer are drawn off into a giant ladle, like water from a spigot, carried across to the furnace by an electric crane and poured into it. Every now and then, as the process goes on, a laborer puts a shovelful of limestone into the mixture to coax off its affinities that remained behind when the ore was under conversion into pig metal.

When the scrap has melted and the contents of the cauldron are cooked enough; when the impurities have been driven out and tolled away, the fiery broth is "seasoned," as it were, with the proper amount of carbon, spiegel, ferro-manganese, tungsten, ferro-silicon, vanadium, or whatever is necessary to give the desired character to the resulting steel.

Then comes the tapping of the furnace. An electric crane lifts a great ladle into position, a workman jams a crowbar through a clay-plugged hole at the base, and out flows the frenzied stream into the ladle. The slag rises to the top like oil on water and overflows, congealing on the outside of the ladle. Then the big crane picks up the ladle, swings it over to the pouring platform, where it in its turn is tapped and its purified fluid run off into molds.

Great care has to be taken in handling these ladles, for the presence of a few drops of moisture when the hot metal is poured into it might cause an explosion and loss of life. Just before they receive the molten metal the ladles are heated nearly white hot in order that the steel or iron may not chill in them.



Photograph from Carnegie Steel Company

A DROP HAMMER FORGING AN AXLE FOR A RAILROAD CAR

The hand that turns the axle rules the commercial world. Industry waits upon the railroad, and the railroad waits upon the mill which makes its equipment.

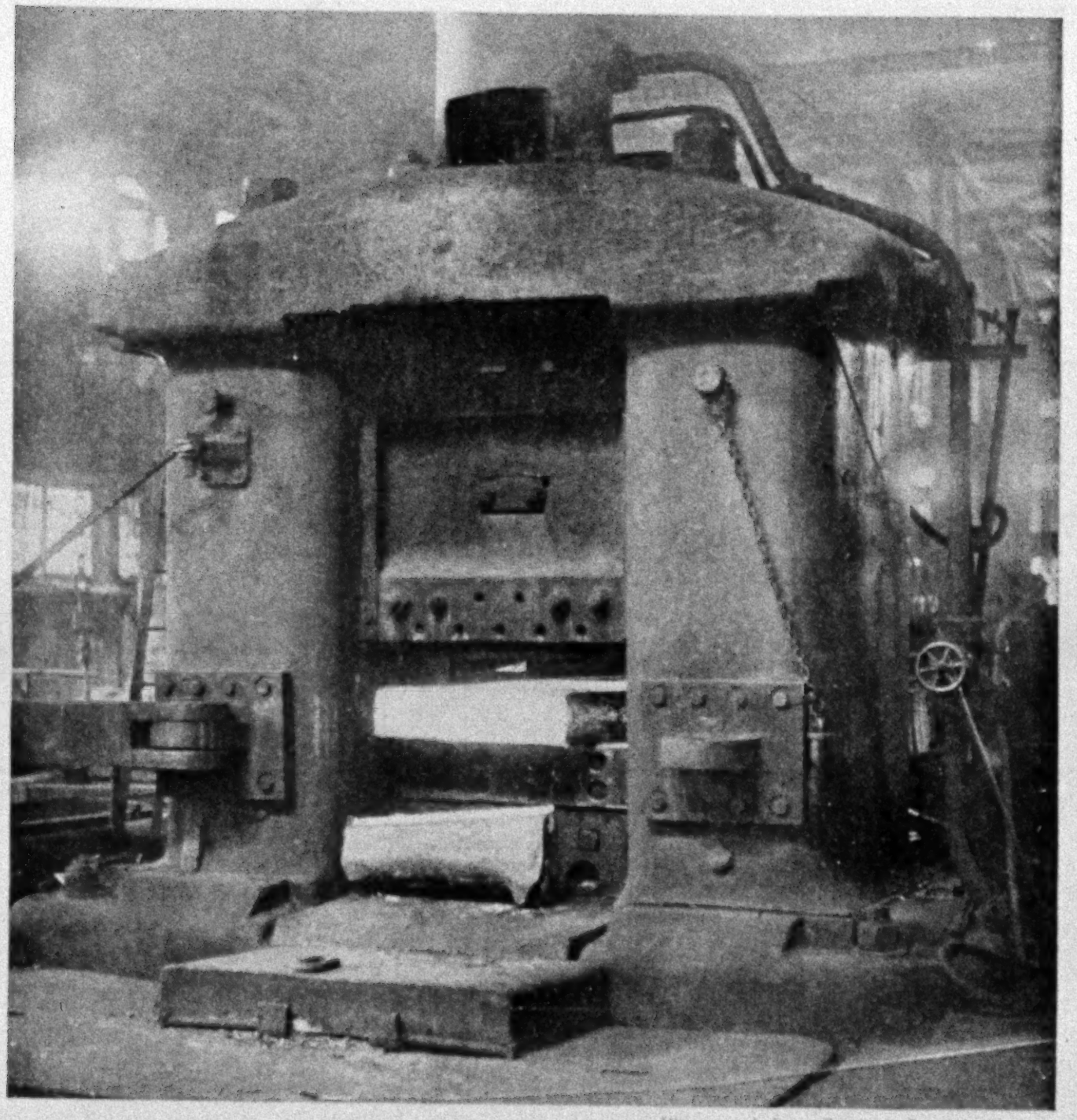
As fast as they are filled the ladles are swung out over the ingot molds and the liquid steel is run into them and allowed to cool and take its solid form. It is as if water were poured into molds and set in a refrigerating machine to freeze into blocks of ice. The only difference is that the "freezing" point of steel is away above the boiling point of water.

There are two other important types of steel furnaces—the crucible furnace and the electric furnace. In both of them the idea is to keep all hurtful gases and other impurities out and to regulate the addition of alloys and oxygen destroyers to a nicety. In a crucible furnace the metal is placed in graphite clay pots, covers are put over them, and the pots subjected to great heat. Silica is gradually absorbed out of the clay in the pots and transformed into silicon by coming into contact with the carbon in the steel. The silicon in its turn absorbs the oxygen and thus quiets the frothing, foaming contents of the kettle.

CROSS-ROADS IN THE STEEL INDUSTRY

The electric furnace acts in much the same way, its heat being so pure that there is no necessity of putting the steel in covered pots to keep out gases and other impurities. An electric arc, established between huge electrodes and the surface of the slag, produces the heat in such a furnace. By varying the materials used in the formation of the slag any impurity can be wooed off and the glowing steel left as pure as crystal. The alloys are then mixed with the steel and it is made fit for any use desired. It is drawn off into ladles and poured into ingot molds, where it hardens, ready to be worked up into those things that constitute the last word in fine steel.

As all roads in the iron industry lead up to pig iron, so all roads in the field



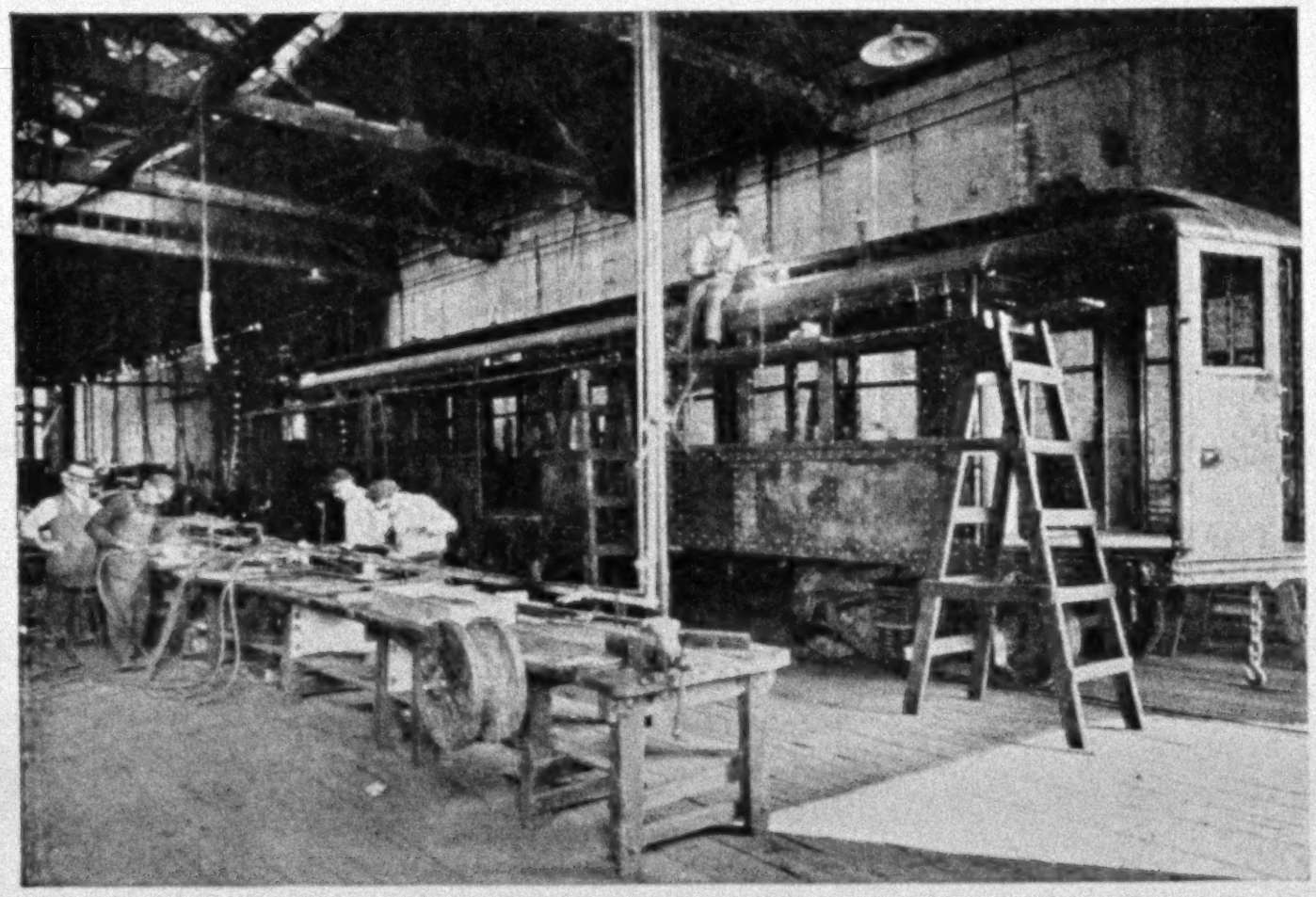
Photograph from Carnegie Steel Company

MONSTER SHEARS CLIPPING STEEL SLABS WITH AN EASE AND SMOOTHNESS WHICH SUGGESTS PARING CHEESE

The capital employed in the steel industry of the United States is greater than the national wealth of Switzerland. The Republic of Portugal—land, improvements, industrials, everything—is not worth as much by a billion dollars as America's steel products were in the single year 1914, a year in which a ton of pig iron sold for less than one-third present quotations.

of finished steel products lead back to the mold. Whether it be a huge girder, a steel rail, a giant shaft, a locomotive drive wheel, a hundred-ton gun, a 14-inch shell, a physician's scalpel, or a pocket-knife, the mold is mother of them all.

And the nemesis of all these products is rust, for iron and steel alike, when exposed to the elements of the air, undergo oxidation, as if yearning to return to that form in which they were taken from the earth. Government experts have estimated that 23 per cent of all iron and steel is destroyed each year through rust, a truly appalling waste to contemplate. Numerous methods are employed to check this tendency to rust. Surfaces are covered with resins, oils, paints, and metallic compounds. One of the most successful of these protective methods, widely used in the automobile industry, is known as the Parker process, perfected



BUILDING MODERN STEEL PULLMANS, THE ACME OF COMFORT AND SAFETY

One of the most striking examples of the improvement of transportation facilities in the march of progress is to be found in the present-day Pullman car, a direct descendant of one of the two parent wooden coaches remodeled into sleeping compartments by a cabinet-maker, George Mortimer Pullman, in 1859. The steel coach is a development of the last few years. It has minimized the number of fatalities consequent to railway accidents and is therefore a notable step forward along the line of economic progress.

by a mechanical and research engineer of Michigan.

Would you know the size of the American steel industry? Then reflect that even before the great world war broke out, even in the slack and uncertain days of 1914, it employed more people than live in Nevada, Arizona, New Mexico, and Wyoming together — four States whose aggregate area is more than twice that of all Germany. The capital employed is greater than the national wealth of Switzerland. The Republic of Portugal — land, improvements, industrials, everything — is not worth as much by a billion dollars as America's steel products were in the single year 1914, a year in which a ton of pig iron sold for less than one-third present quotations, and a ton of steel likewise.

Think of an ore train so long that it would take a fortnight to pass a given point, running at full freight-train speed and never stopping! Think of ore ships moving in column formation and stretching from Detroit, Mich., to Erie, Pa.! Think of a row of blast furnaces reaching from New York City to Chester, Pa.; of a column of rolling mills and puddling furnaces reaching from New York to Indianapolis! Think of a stream of ten tons of liquid iron flowing out as molten pig metal every second of the year!

Then you will begin to get a picture of the vastness of the steel industry. It is steel, steel, steel, everywhere and always — steel for guns, steel for shells, steel for ships. Without American steel the German submarine would conquer the oceans, the German war machine would starve our Allies, overrun France, master Russia, and work its own good pleasure upon all the earth. But with American steel that can never be done. The road to victory for autocracy has been closed by the unyielding gate which American industry has put across its path.

MECCA THE MYSTIC

A New Kingdom Within Arabia

By Dr. S. M. Zwemer

OF ALL the provinces of Arabia, El Hejaz, which recently revolted against Turkish rule and set up its own kingdom, with the Grand Sherif of Mecca as sovereign, undoubtedly has most frequent contact with the outside world, yet is the least known. Parts of it have never yet been explored.

El Hejaz is so named because it forms "the barrier" between Tehama, the coast province on the south, and Nejd in the interior. Its sole importance is due to the fact that it contains the two sacred cities, Mecca and Medina, which for more than thirteen centuries have been the centers of pilgrimage for the Moslem world.

Before the railway was completed from Damascus to Medina, the port of that city, Yenbo, was as flourishing as Jiddah is now; but at present it has almost the appearance of a deserted city. The whole pilgrim traffic has been diverted, and even the caravan route from the coast to Medina is at present unsafe.

The importance of Mecca is not due to its resident population of perhaps 100,000, but to the more than 200,000 pilgrims who visit it each year from every nation of Islam. Statistics are hopelessly contradictory and confusing regarding the number of annual visitors. According to Turkish official estimates, in 1907 there were no less than 280,000 pilgrims. It is a marvel how so many thousands can find food, shelter, and, most of all, drink in such a desert city.

The religious capital of Islam, and now the temporal capital of the new Kingdom of Arabia, affords an index to the growth and strength of Mohammedanism in various parts of the world, for one can rightly gauge the strength of religious fervor in this great non-Christian faith by the number of those who go on pilgrimage.

From Java, Bengal, West Africa, Cape Colony, and Russia, as well as from the most inaccessible provinces of China, they come every year and return to their native land—if they escape the hardships of travel—to tell of the greatness and glory of their faith, however much they may have been disappointed in the actual condition of the city and its sacred buildings.

MOHAMMED'S PROPHECY FULFILLED

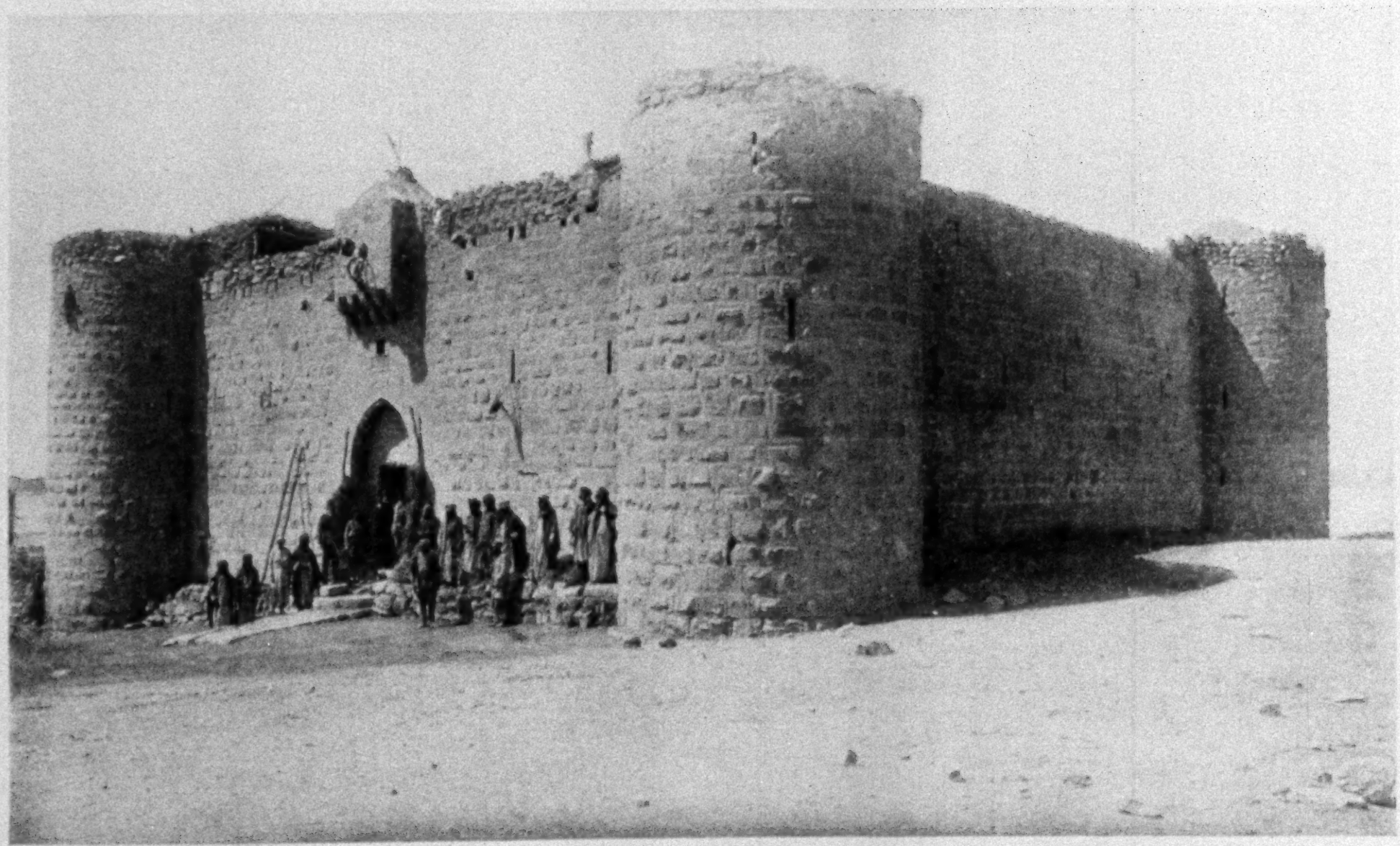
When we consider Mecca, Mohammed's words of prophecy in the second chapter of his book seem to have been literally fulfilled: "So we have made you the center of the nations that you should bear witness to men." The old pagan pantheon has become the religious sanctuary and the goal of universal pilgrimage for one-seventh of the human race.

From Sierra Leone to Canton, and from Tobolsk to Cape Town, the faithful spread their prayer carpets, build their houses (in fulfillment of an important tradition, even their outhouses!), and bury their dead toward the meridian of Mecca. If the Old World could be viewed from an aëroplane, the observer would see concentric circles of living worshipers covering an ever-widening area, and one would also see vast areas of Moslem cemeteries with every grave dug toward the sacred city.

Mecca is no longer a veiled city. A score of intrepid travelers have unveiled it. From Bartema, Wild, and Joseph Pitts to Burton, Burckhardt, Hurgronje, and Courtellemont, they took their lives in their hands, herded with strange companions, underwent untold hardships, and by luck or pluck came scatheless out of this lion's den of Islam. According to Doughty, scarcely a pilgrimage takes place without some persons being put to death as intruding Christians. An edu-

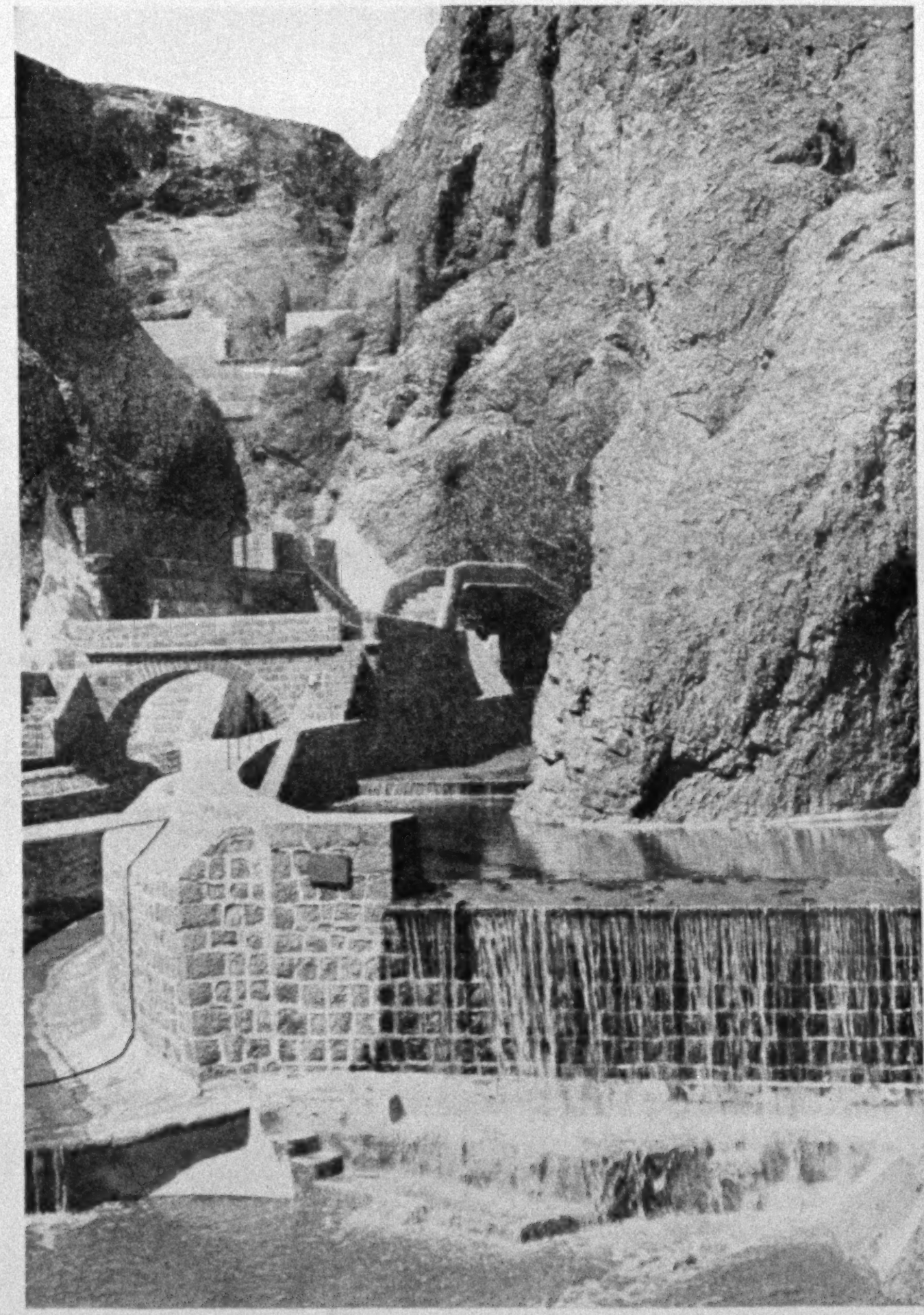
XUM

PILGRIMS ASSEMBLED IN DAMASCUS ABOUT TO BEGIN THE JOURNEY TO MECCA, BEARING WITH THEM THE HOLY CARPET FOR THE MOHAMMEDAN SHRINE



AN ARABIAN FORT FORMERLY USED AS A PLACE OF REFUGE AND SHELTER FOR PILGRIMS ON THEIR WAY TO MECCA

The construction of the Pilgrims' railway has minimized the importance of these forts to the faithful, but in olden days they were a welcome protection from marauders and robbers who infested the routes to the holy cities of Mecca and Medina



Photograph from Charles E. Moser

THE FAMOUS TANKS OF ADEN, SET DEEP IN THE POCKETS OF SURROUNDING HILLS, WHERE THEY CATCH AND STORE THE SCANT RAINFALL OF THIS REGION OF ARABIA

Who built these great reservoirs archæologists will not venture to say definitely, but they are supposed to have been the work of the Hemyarites, the enlightened sons of Sheba's queen. They are supposed to be 1,500 years old, and for centuries they were filled with debris and forgotten. An English officer excavated them in 1856 and found their masonry still intact.

Photograph by Charles E. Moser

TWILIGHT ON THE SHORES OF THE RED SEA

cated and pious Moslem here in Cairo assured me only a few months ago that when he went on pilgrimage and took pictures of the city his life was endangered more than once by the fanaticism of the inhabitants. However, there are many who believe that the opening of the Hejaz Railway, especially as a branch is to be carried to Jiddah, the breaking up of Turkish power in Arabia, and the establishment of the new kingdom will mean the removal of restrictions against non-Moslems.

On a recent visit to Jiddah, the port of Mecca, I was able not only to take some good photographs myself of that port of entry and learn particulars in regard to the pilgrim traffic, but I sent a telegram to Mecca to a leading Moslem photographer, whose establishment is not far from the Ka'aba itself, and received by registered post a number of beautiful photographs which I am glad to share with the readers of the NATIONAL GEOGRAPHIC MAGAZINE.

Jiddah is a town of about 50,000 inhabitants, of whom 100 are Europeans. It has only four leading mosques, but 30 inns, and one large enough to be called a hotel. None of them, however, is a fit place for the European tourist.

ONLY INDUSTRY IS FLEECING PILGRIMS

The only industry of Jiddah is fleecing pilgrims. Cisterns are kept near every house and filled with rain water, which is sold in the pilgrim season at a high price. At one time the governor of the Hejaz laid pipes from a spring of water 10 kilometers from the town, but when the pipes were worn out the people opposed the reconstruction of this public utility, as it interfered with their perquisite of water-selling. The Turkish Government itself receives as revenue from the pilgrims about $250,000 every year, and it is a well-known fact that the slave trade, both here and at Mecca, is still carried on. Many of the pilgrims from the Sudan and Somaliland do not scruple to sell even their own children in these slave markets!

The mixture of races in Hejaz province for so many centuries has not been conducive to morals or good government. No one who has read the account of social life at Mecca, as given by Hurgronje and other travelers, including Moslem

Photograph by Rev. Samuel M. Zwemer

THE SYRIAN MAHMAL ON ITS WAY TO MECCA

The Mahmal is an annual present of tapestries, gold specie, or other gifts sent by various Moslem countries to the Grand Sherif of Mecca. The beautiful Ka'aba covering, woven of silk and cotton tissue in a factory at Cairo and renewed every year, is sent with the Egyptian Mahmal.

pilgrims themselves, can doubt the need for social reform in this city. Mecca is the microcosm of Islam in its religious life and aspirations. According to Hurgronje, "It is Islam, the official religion, which brings together and amalgamates all the heterogeneous constituents of Meccan life. On the other hand, this society itself welds into a chaotic whole the prejudices and superstitions of all countries." In other words, Mecca is the sink-hole of Islam. All witnesses agree as to the flagrant immorality which pervaded the streets, and even the mosque, of the sacred city, the prevalence of the slave trade, the fleecing of pilgrims, and the corruption of the late Turkish Government.

The Turkish prison is an indication of the backward state of prison reform in this part of the world. The prisoners were kept in wooden stocks in dark rooms and there was no sanitation whatsoever, with the temperature in the shade often 110 degrees Fahrenheit. No food was provided by the government, and unless a man's friends or kindly charity intervened he was apt to die of starvation. All the machinery of government moved clumsily at so great a distance from the Sublime Porte.

EVERY PILGRIM HIS OWN POSTMAN

Although there is a telegraph service between Mecca and Jiddah, the wires are often out of order, and most of the telegrams received during the pilgrim season fail to reach the addresses. The post-office at Mecca under Turkish régime was certainly unique. A recent writer tells us how "the sacks of letters are thrown out into the narrow street leading to the post-office and there sorted by the pilgrims themselves, who open them and take their letters and those of their friends also." A similar system prevailed at Medina, Yenbo, and Jiddah. All this may be changing under King Husein, who has already taken steps to join the International Postal Union and has had stamps printed in Egypt bearing the inscription "Hejaz Post."

The commerce of Mecca is entirely in the hands of foreigners, mostly Indians, who sell rosaries, carpets, and silk stuffs. One of the main occupations of the silversmiths is the manufacture of rings, which are supposed to be constructed from silver that was once part of the sacred temple doors, and are reputed to be an effective remedy for certain ills. Most of the natives, however, earn their living as guides to the pilgrims and grow wealthy during the season. If each of the pilgrims spends $25, which is a low average, the aggregate income of the city would be $5,000,000; so one is not surprised to see a number of stately houses at Mecca and the display of considerable wealth.

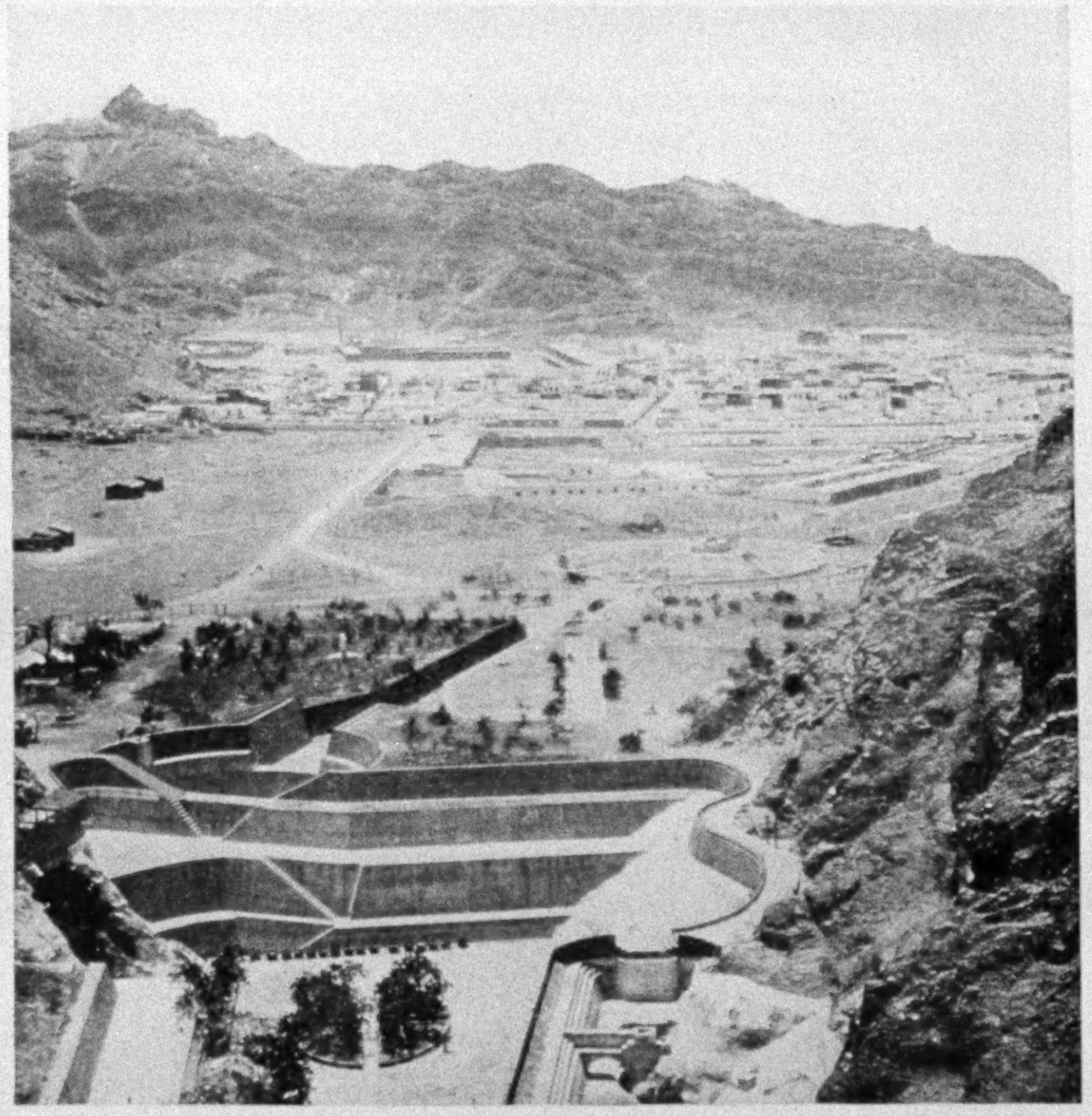
The earliest settlements at Mecca were undoubtedly due to the fact that the caravan trade from South Arabia northward found here a stopping place near the spring of Zem Zem, long before the time of Mohammed, just as the early Roman settlements at Wiesbaden and other places in Germany were so located because of the medicinal waters.

The sacred mosque, *Mesjid el Haram* with the Ka'aba as its center, is located in the middle of the city. Mecca lies in a hot, sandy valley, absolutely without verdure and surrounded by rocky, barren hills, destitute of trees or even shrubs. The valley is about 300 feet wide and 4,000 feet long and slopes toward the south. The Ka'aba, or House of God (*Beit Allah*), is located in the bed of the valley. All the streets slope toward it and it stands, as it were, in the pit of a theater.

THE BLACK STONE, MECCA'S OLDEST TREASURE

The houses in Mecca are built of dark stone and are elevated in order to accommodate as many pilgrims as possible. The streets are nearly all unpaved. In the summer they are full of dust, and in the rainy season—which, fortunately, is not frequent—they are black with mud.

Strangely enough, although the city is poorly provided with water except for the famous spring of Zem Zem, Mecca has suffered more than once from destructive floods, which, tearing down the narrow valley, have destroyed buildings and damaged even the Ka'aba. A terrible inundation took place on the 23d of



Photograph from Charles E. Moser

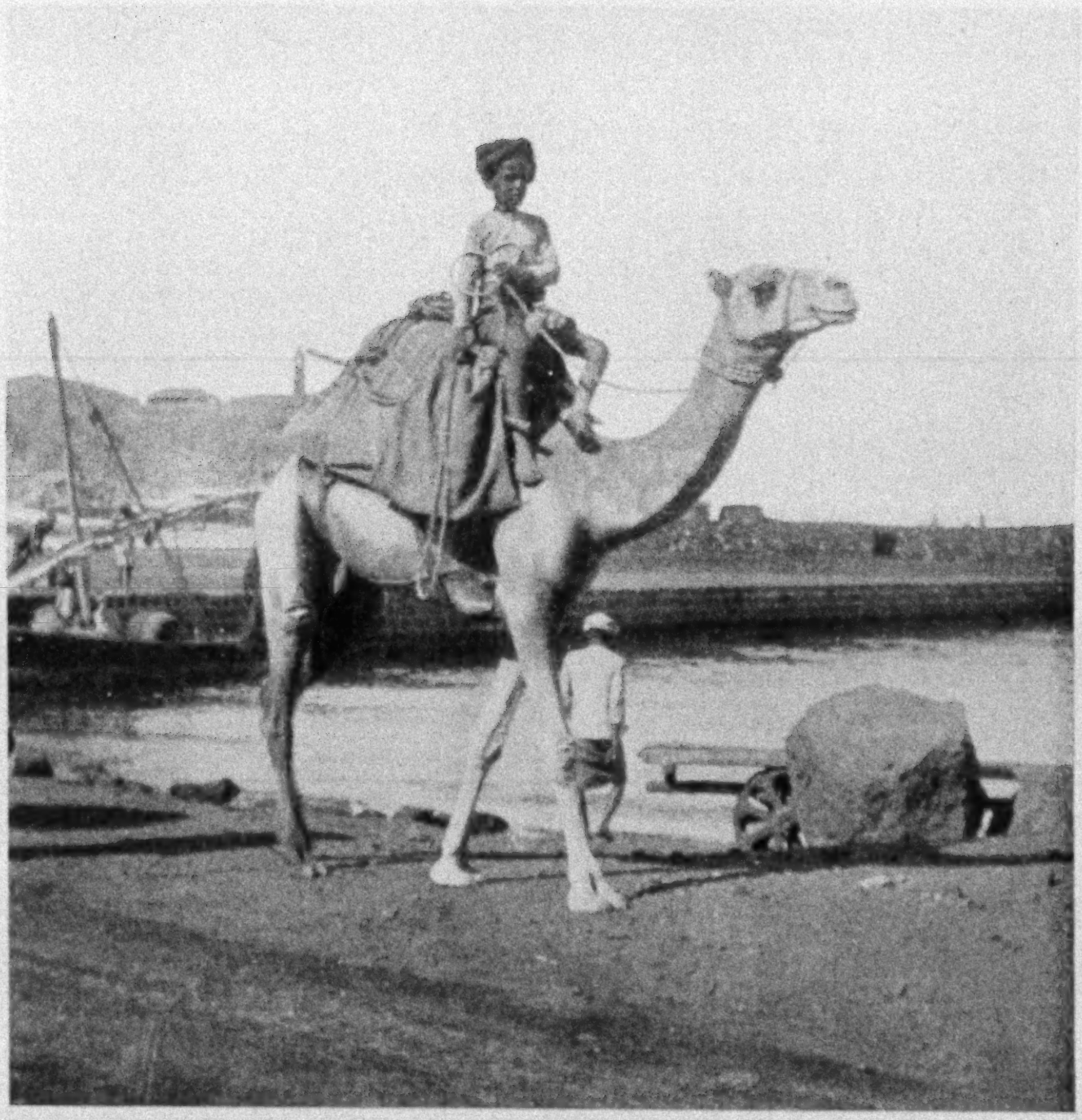
A VIEW OF ADEN FROM THE TANKS: ARABIA

This British seaport, which stands guard at the southeastern entrance to the Red Sea, nestles in the crater of an extinct volcano, whose rugged walls are plainly seen in the background. The tanks provide a part of Aden's limited water supply.

Dhu'l Hajj, 1327 A. H. (1909). The water reached nearly to the door of the Ka'aba and the whole court was inundated.

The Ka'aba proper stands in an oblong space 250 paces long and 200 broad, surrounded by colonnades, which are used as schools and as a general meeting place for pilgrims. The outer inclosure has nineteen gates and six minarets; within the inclosure is the well of Zem Zem, the great pulpit, the staircase used to enter the Ka'aba door, which is high above the ground, and two small mosques called El Kubattain. The remainder of the space is occupied by pavements and gravel, where prayers are said by the four orthodox sects, each having its own allotted space.

In the southeast corner of the Ka'aba, about 5 feet from the ground, is the famous Black Stone, the oldest treasure of Mecca. The stone is a fragment resembling black volcanic rock, sprinkled with reddish crystals, and worn smooth by the touch of centuries. It was undoubtedly



Photograph by Charles E. Moser

A KHAT CARRIER OF YEMEN

About 11 o'clock in the morning the khat camels come winding leisurely along the isthmus road from the interior." The khat plant grows far removed from the salt air of the sea and requires a cool, even temperature, flourishing at elevations between 4,000 and 6,000 feet.

an aërolite and owes its reputation to its fall from the sky. Moslem historians do not deny that it was an object of worship before Islam. In Moslem tradition it is connected with the history of the patriarchs, beginning as far back as Adam.

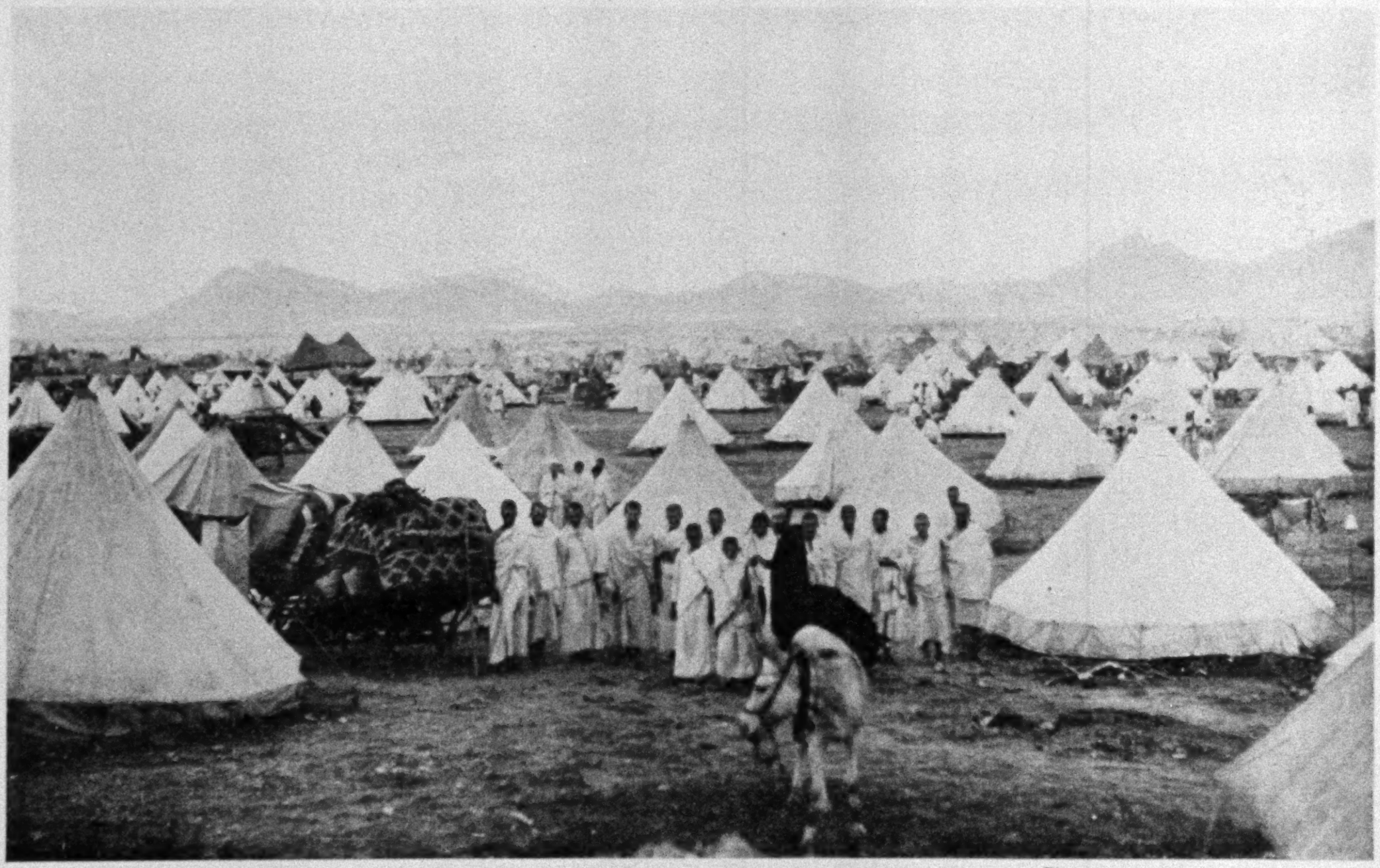
The word Ka'aba signifies a cube, although the measurements, according to Ali Bey, one of the earliest writers who gives us a scientific account of the pilgrim ceremonies, do not justify its being called so. Its height is 34 feet 4 inches, and the four sides measure 38 feet 4 inches, 37 feet 2 inches, 31 feet 7 inches, and 29 feet. The cloth covering is renewed every year. At present it is made of silk and cotton tissue woven at El Khurunfish, a factory in Cairo. The time of departure of the annual procession which takes it to Mecca is one of the great feast days in Cairo.

Formerly, we are told, the whole of the Koran was interwoven into the Ka'aba covering. Now the inscription contains the words, "Verily, the first house founded for mankind to worship in is that at Mecca, a blessing and a direction to all Christians." Seven other short chapters

Photograph from Rev. Samuel M. Zwemer

THE VALLEY OF MINA DURING THE SEASON OF PILGRIMAGE

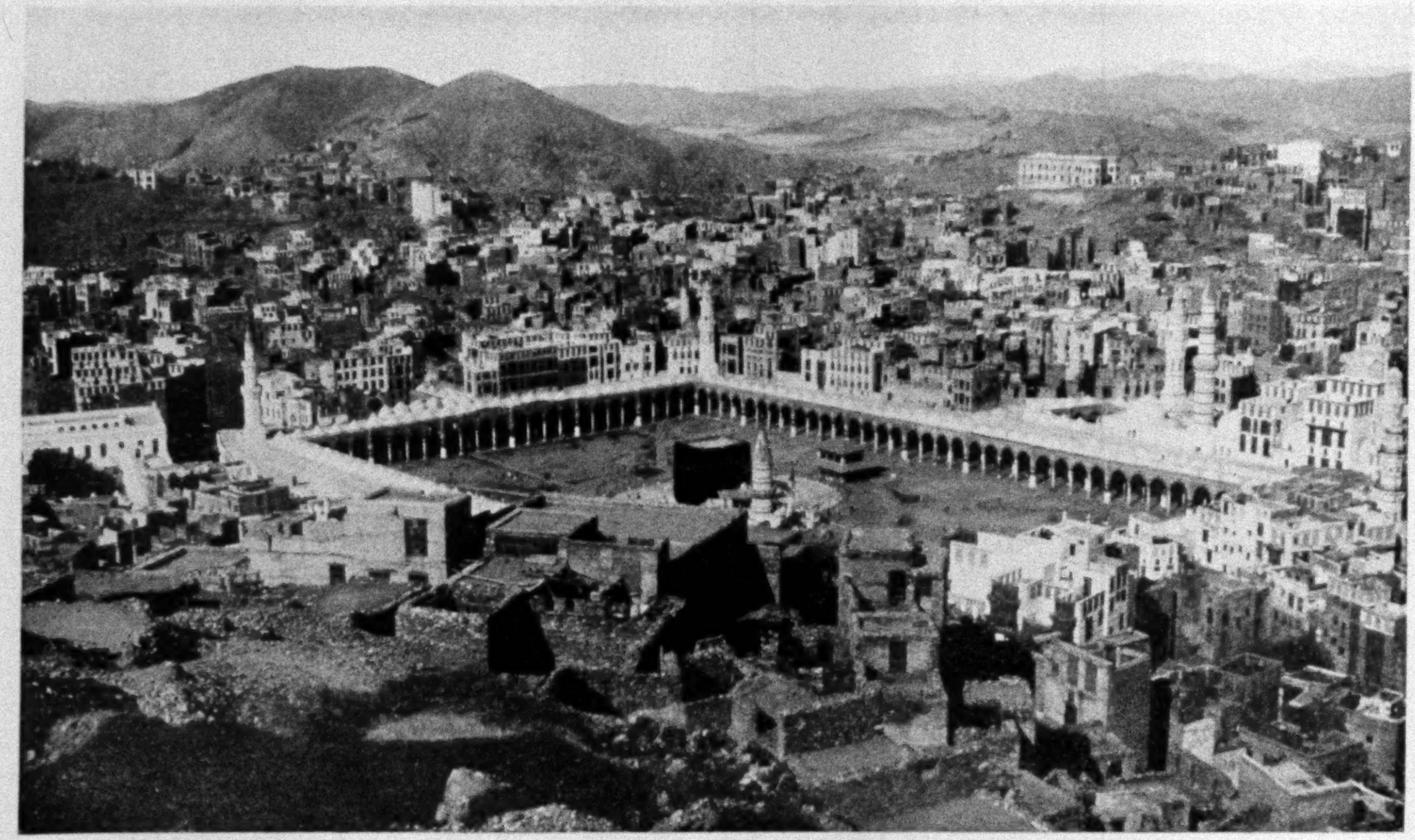
In this narrow valley, two or three hours' journey from Mecca, take place some of the most important pilgrim ceremonials of the Moslem ritual. Here on the "day of sacrifice" the pilgrim slays a lamb or a kid or some other animal and makes a sacrificial meal. After this ceremony Mina becomes a trade mart, resembling a great international fair, conducted by merchants from every quarter of the Mohammedan world.



Photograph by Rev. Samuel M. Zwemer

PILGRIMS ENCAMPED OUTSIDE MECCA

The importance of Mecca is in no respect due to its resident population of 100,000, but to the more than 200,000 pilgrims which visit it annually. When the pilgrim, who may have been en route for two years from the most distant corner of the world, reaches a point five or six miles distant from the sacred city he performs his ablutions and prayers, then lays aside his regular wearing apparel and dons two seamless wrappers. For the remainder of the journey he goes without shoes or head covering. During the period of ceremonial he neither shaves nor trims his nails.



Photograph from Rev. Samuel M. Zwemer

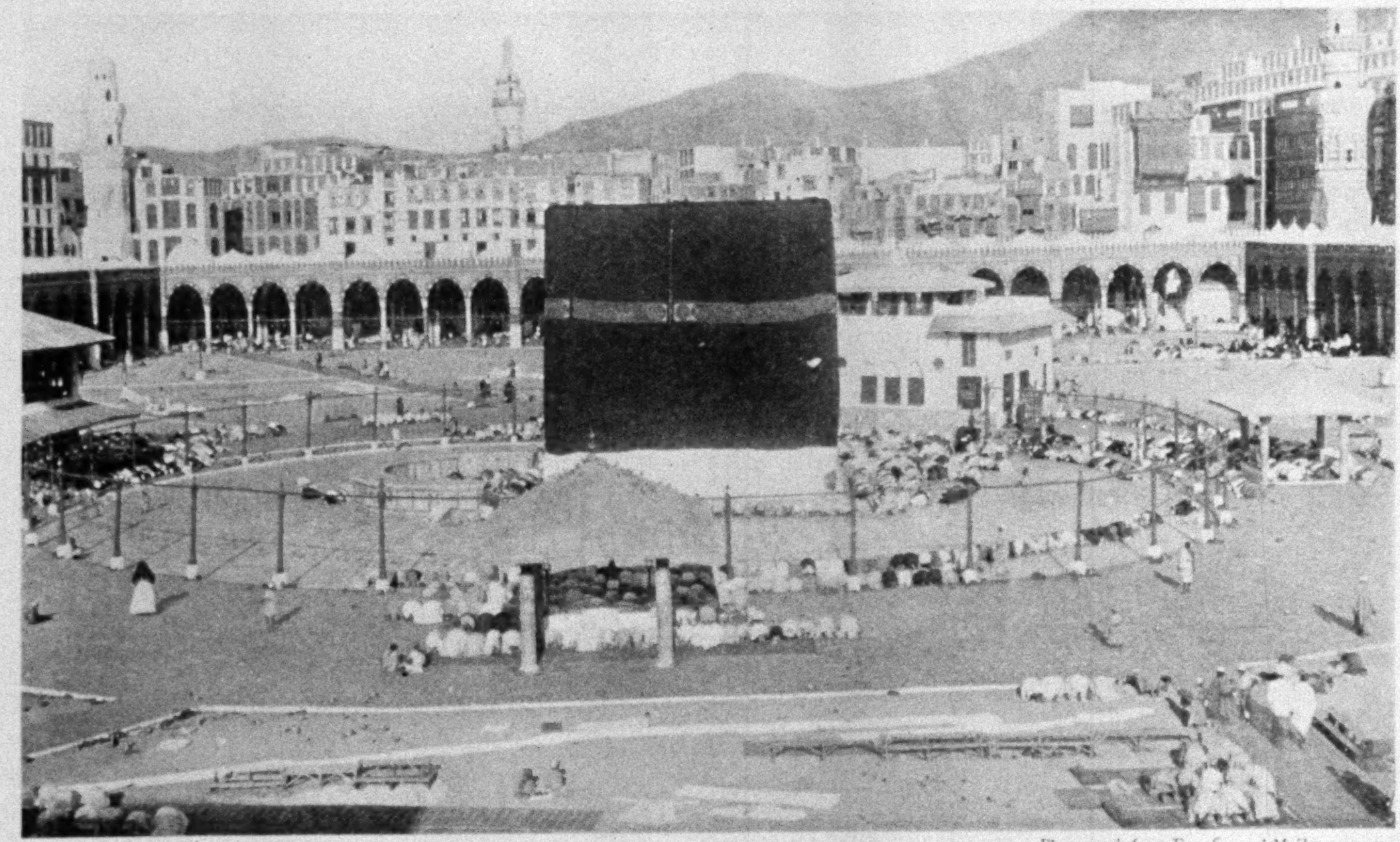
BIRD'S-EYE VIEW OF MECCA, THE RELIGIOUS CAPITAL OF ISLAM AND THE TEMPORAL CAPITAL OF THE NEW KINGDOM OF ARABIA

"So we have made you the center of the nations that you should bear witness to men," wrote Mohammed in the second chapter of his book. In fulfillment of that prophecy, this city is the sanctuary and the goal of pilgrimage for one-seventh of the human race.

Photograph from Rev. Samuel M. Zwemer

THE NEW KING OF ARABIA ASSISTING IN THE CELEBRATION OF THE CONSTITUTION OF MECCA

The Grand Sherif of Mecca, Husein Ibu Ali, spiritual head of the followers of Mohammed and recently proclaimed temporal head of the Kingdom of Hejaz, is identified by the white star. This photograph was taken while Hejaz was still under the domination of the Sublime Porte.



Photograph from Rev. Samuel M. Zwemer

PILGRIMS FROM THE FOUR CORNERS OF THE EARTH PROSTRATING THEMSELVES BEFORE THE MOSLEM HOLY OF HOLIES: MECCA

Supposedly a reconstruction of the stone house in which our first parents dwelt in Paradise, the Ka'aba is cubical in shape. In the south-east corner is the famous Black Stone. At least once during his life every devout Moslem hopes to kiss this stone, worn smooth by the touch of lips for centuries. It is an aërolite and undoubtedly owes its reputation to its fall from the sky. In the foreground of this picture may be seen the shrouds for the dead, which have been soaked in the sacred waters of Zem Zem, the well from which Hagar drew the water which revived the dying Ishmael. These shrouds are taken home by the pilgrims and used for burial purposes.

of the Koran are also woven into this tapestry, namely, the Chapter of the Cave, Miriam, Al Amran, Repentance, T. H., Y. S., and Tobarak.

RITUAL OBSERVED BY ORTHODOX PILGRIMS

The inscription over Bab es Safa is also from the Koran and reads as follows: "Verily, Es Safa and El Mirwa are among the signs of God. Whoever then maketh a pilgrimage to the temple or visiteth it shall not be blamed if they go round about them both." This gate leads out to the hills beyond the city where certain pilgrim rites are performed. Over the Mirwa gate there is (unless it has been removed by the new king) a small tablet in honor of the Sultan of Turkey, who erected it.

The Mahmal is an annual present of tapestries, gold specie, or other gifts sent by various Moslem countries to the Sherif of Mecca. The Ka'aba covering accompanies the Egyptian Mahmal.

Arriving within a short distance of Mecca, orthodox pilgrims, male and female, put off their ordinary clothing and assume the *ihram*, which consists of two pieces of white cloth, one tied around the loins and the other thrown over the back. Sandals may be worn, but not shoes, and the head must be uncovered. After certain ablutions the pilgrim enters the mosque, kisses the Black Stone, and runs around the Ka'aba seven times. After special prayers he proceeds to the place of Abraham, then drinks from the holy well, and once more kisses the Black Stone. After this follows the race between the two hills, Safa and Mirwa.

Little books of ritual prayers to be used by the pilgrims are sold to every one, and there is great punctiliousness in observing every detail correctly. On the seventh day of the pilgrimage there is a sermon from the grand pulpit. On the eighth day the pilgrim goes to Mina, three miles distant from Mecca, and spends the night. The next morning he leaves for Arafat, another hill a short distance from Mecca, and the following day is the great day of sacrifice, simultaneously observed throughout the whole Moslem world. Early in the morning the pilgrims go to Mina, where there are three pillars, called the Great Devil, the Middle Pillar, and the First One. Here each pilgrim flings seven pebbles to show his hatred of Satan and his love for God. He then performs the sacrifice of a sheep, goat, or camel, according to his means, the victim being placed toward the Ka'aba and the knife plunged into the animal's throat with the cry, "Allahu Akbar." This ceremony concludes the pilgrimage proper.

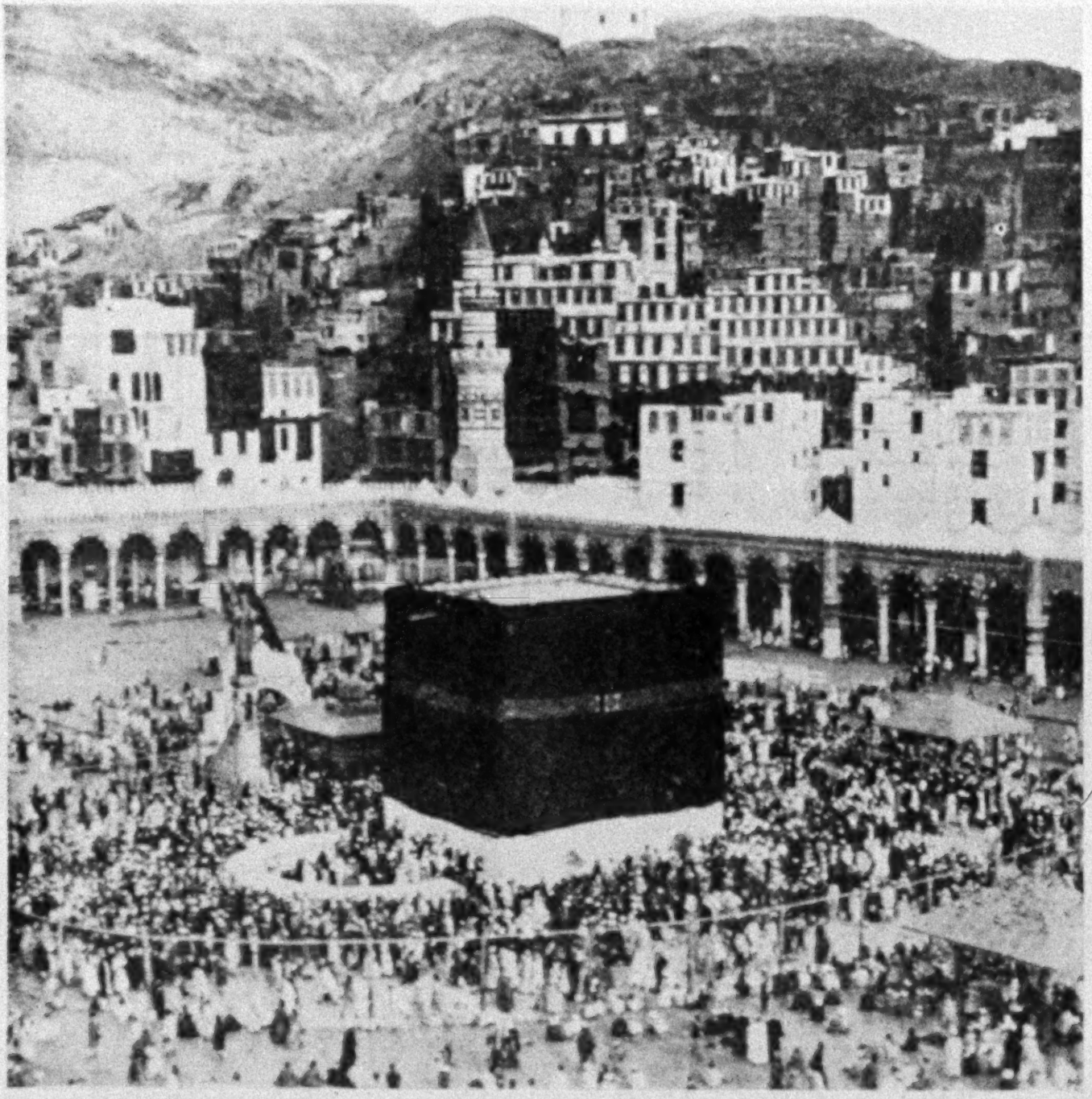
After visiting Mecca most Moslems also go to Medina to visit the tomb of the Prophet. At present, because of the railway, many of them pay this visit first. The pilgrimage to Medina is called *Ziyarat* and that to Mecca *Hajj*. The latter is obligatory; the former meritorious.

The Prophet's mosque at Medina is about 420 feet long by 340 broad. It also is surrounded by a large courtyard and porticoes. The *Hujrah*, or place of the tomb, has four gates, which are carefully locked and guarded by eunuchs. Within the inclosure there are four graves and place for a fifth. Next to Mohammed himself lies Abu Bekr, his father-in-law; next to him Omar, founder of the imperial power of Islam, and a short distance away is the grave of the Prophet's beloved daughter, Fatima. Between Fatima's grave and that of Omar is a space left empty. According to Moslem tradition, it was the wish of Mohammed that this place should be reserved for Jesus on his second coming and death.

Between Medina and Mecca are some of the famous battle grounds of early Islamic days. On one of these the battle of Ohod was fought, when the Koroish of Mecca, after their defeat at Bedr, overcame the Moslem army, and where Mohammed himself was seriously wounded. Hamza, a valiant warrior of Islam, lies buried here.

SACRED CITIES FREED FROM TURKISH YOKE

On the occasion of the anniversary of the proclamation of the constitution at Mecca, all the worthies take part in the ceremonies. Over the doorway of the building where the celebration takes place lanterns are hung to illuminate the Arabic inscription: "In liberty is the



THE HUB OF THE MOSLEM UNIVERSE, THE SACRED KA'ABA AT MECCA

The Ka'aba stands in the center of the sacred mosque, Mesjid el Haram. The colonnades which surround it are used for housing pilgrims. All the streets of the city slope toward this House of God (Beit Allah).

peace of the people and in fraternity is the bond of union."

The Turkish Government, however, was most unsuccessful in introducing liberty and reform in the province of Hejaz, as it has been in other portions of the empire. Their task, even had they made a conscientious effort, would have been especially difficult here because of the mutual hatred between Turks and Arabs, the restless character of the Bedouin population, and the utter collapse of all respect for authority after the Turkish defeat in the Balkan War. The Arabs have at last insisted upon ruling their sacred cities themselves and have placed the Grand Sherif of Mecca, El Husein Ibn Ali, on the temporal throne of the new kingdom, as well as upon the spiritual throne of the whole Moslem world, save that portion dominated by the Sultan of Turkey.

"THE FLOWER OF PARADISE"

The Part Which Khat Plays in the Life of the Yemen Arab

By Charles Moser

Formerly American Consul, Aden, Arabia

IT WAS a hot Sunday morning and our *tikka gharry* dragged itself up the old Aden road that comes out at the crater pass like a fly on three legs. The road was speckled with natives in bright clothes, humming with excitement. What it was all about we could not discover. Presently Ali Yusuf came trotting by on his little roan ass, brave in a new purple coat with gilt trimmings, his lean shanks dangling so low that his heels scraped the dust. "Ali Yusuf, what means this?" we cried. "Has not Ramazan passed and Mohorrum not yet come?"

Ali Yusuf salaamed gravely. "Sahib, it is the marriage."

"What marriage?"

"Of Zeila, daughter of old Bhori, the tin-seller in the bazaar, to Abdul Khan, whose father is jemidar of chaprassies at the *burra* bungalow."

"But why are the people here, where there is no bridegroom and no *makhdara* (wedding pavilion) for their entertainment?"

Ali Yusuf pitied our ignorance. "Sahib," he spoke gently, "it is the poor relations, and they wait for the poor man's happiness."

At that moment shrill yells burst out from the pass above us and, looking up, we saw a crowd of boys racing toward the town. As they ran they shouted, *"Al khat aja!"* (The khat has come), and the people on the road broke into a joyous tumult. Then the tunk-a-lunk of a tom-tom in the house of the bridegroom took up the tidings and beat out its summons to the wedding guests.

As we crawled over the crater's lip, under the frowning archway of the pass, we came upon the khat-bearing camel encompassed about by a cloud of witnesses, dancing. Swathed around his belly and over his load of dripping green herbs was a glorious silken cloth, blazing with silver and gold and hung with jasmine sprays; and though tom-toms thumped and fifes squealed out a furious music all about him, the solemn beast bore his burden as if it were some majesty of state. So passed the blessed khat, the poor man's happiness, the strength of the weak, the inspiration of the mean-spirited, to its place at the marriage feast.

SCIENCE KNOWS LITTLE ABOUT KHAT

The world knows almost nothing about khat. Our scientific books are nearly silent on the subject. Travelers who ought to have observed its uses write from hearsay and usually with the most amazing ignorance. There are even Europeans in the Yemen, whose servants have chewed khat every day of their lives, with so little knowledge of native life and customs that after years of residence they ask, "Why, what is khat? We never heard of it." Yet no Yemen event is complete without its presence, and no Yemen Arab—man, woman, or child—passes a day if he can help it without the aid of at least a few leaves of the precious khat.

When the European is weary he calls for alcohol to revive him; when he is joyful he takes wine, that he may have more joy. In like manner the Chinese woos his "white lady," the poppy flower, the Indian chews bhang, and the West African seeks surcease in kola. Khat is more to the Yemen Arab than any of these to its devotees. It is no narcotic, wooing sleep, but a stimulant, like alcohol. Unlike alcohol, it conceals no demon, but a fairy. The khat eater will tell you that when he follows this fairy it takes him into regions overlooking paradise. He calls the plant the "flower of paradise."

How and when khat came into the Yemen is not certain. Botanists say that it was brought over from Harrar, in

Photograph from Charles K. Moser

THE AUCTION BLOCK, WHERE THE ARAB BUYS HIS DAY'S SUPPLY OF KHAT

"How much! How much! will you give for this flower of paradise? 'Tis sweet as a maiden's eyes; 'tis like bees' breath for fragrance; 'tis——"

Abyssinia, many centuries ago. There is a tradition among the wise men of the East that the sheikh Ibrahim Abou Zarbayn introduced it into Hodeidah from Ethiopia about 1430. But ask any Yemen Arab and he will tell you, "It has been always. Allah gave it to us in the beginning, to make us forget labor and pain." And for the surcease of khat he will spend more of his earnings than for all the rest of his meager necessities of life. A coolie who earns 30 cents per day spends 10 cents of it for the support of his family and the rest for khat. A wealthy merchant will consume many rupees' worth in the course of an afternoon.

There's a reason. "Cut off my strong hand," cries the sambuk coolie, his back bent under a goatskin bale of three hundredweight, "and I will become *Hadji*, the sweeper (a despised caste); but take away my khat and let me die." In the morning your Arab servant is surly and taciturn, your friend the coffee merchant sharp at a bargain and acrid of manner. In the afternoon your servant, with a wad of the vivifying leaves in his cheek, does your commands with smiles and a light foot, and the punkah-wallah who slept through the morning now keeps your office fans moving briskly. Your friend the merchant bestows compliments and presents upon you; by Allah, he will buy your horse for the price of an elephant and find no favor too great to give you. The bale the coolie could not lift this morning is now but a feather on his back. Without khat your Arab, laborer or gentleman, is evasive, apathetic, dull; with it he performs prodigies of strength and energy.

THE HOME OF THE KHAT BUSH

Catha edulis, our plant's botanical name, grows to some extent in Abyssinia, but it is cultivated chiefly in the mountains of the Yemen interior behind Aden. The word khat is said to be derived from another Arabic word *kut*, meaning sustenance or reviving principle, and refers to the most salient property of the plant,

Photograph from Charles K. Moser

WELL PROVIDED FOR THE DREAM JOURNEY TO PARADISE VIA THE KHAT ROUTE

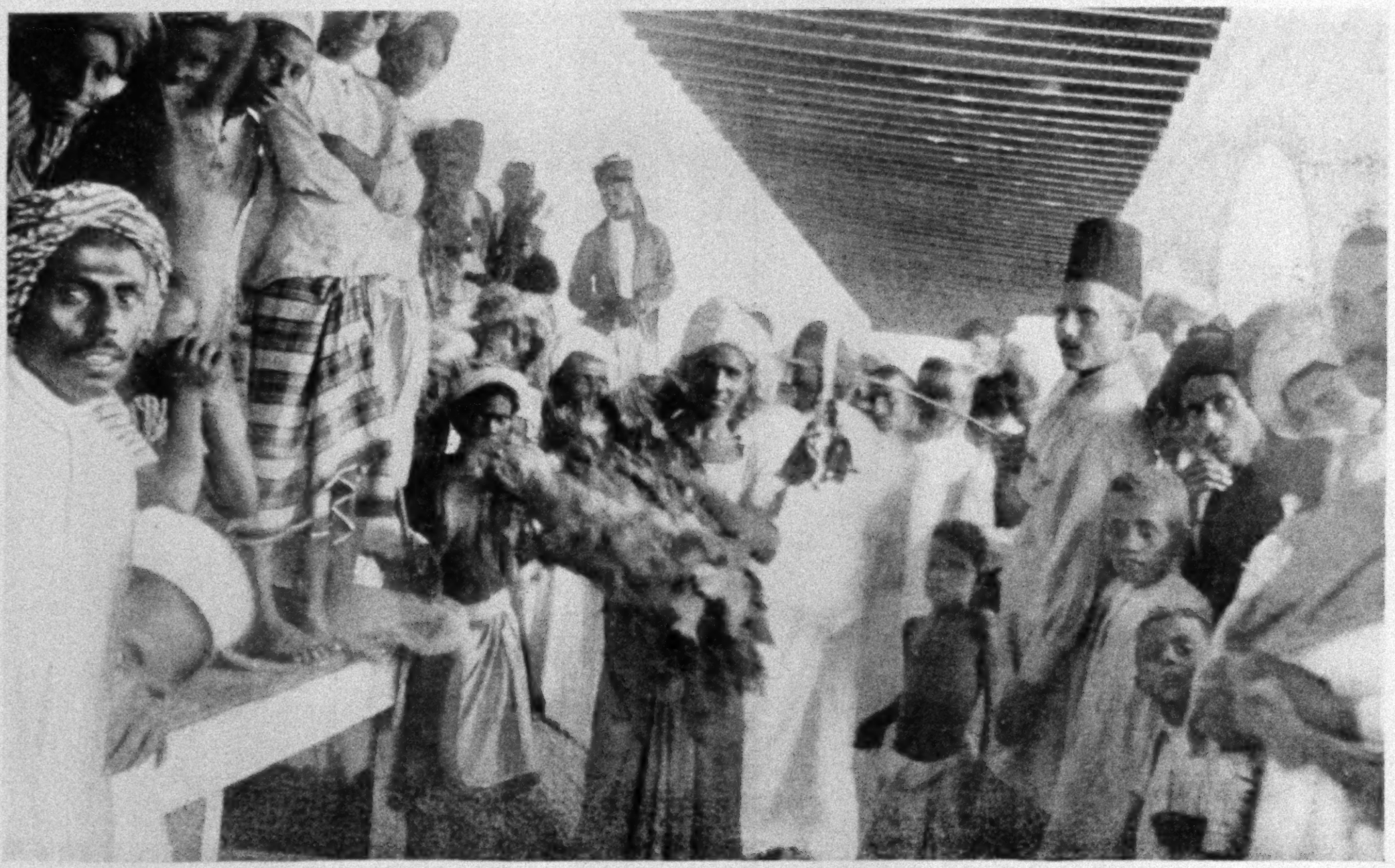
No Yemen Arab—man, woman, or child—passes a day, if he can help it, without the aid of at least a few leaves of the precious khat, which takes him to the regions overlooking paradise.

that of exalting the spirits and supporting the bodily strength, under extraordinary conditions, of one who eats its leaves. The researches of Albert Beitter, of the University of Strassburg, seem to show that its active principle is an alkaloid in the form of crystals, very bitter and odorless. From this alkaloid and its crystallized salts he is said to have obtained small quantities of katinacetate, katinsulphate, katinhydrochlorate, katinhydrobromide, and katinsalicylate. He found khat leaves to contain also some essential oils, tannic acid, and mannite.

Along the steep, terraced slopes of the mountains between Taiz and Yerim you will find the small plantations of the khat farmer. Not till you have climbed nearly 4,000 feet will you see the first one, and when you reach 6,000 feet you will have passed the last. The hardy plant must have a cool, even temperature, far removed from the salt air of the sea and without sand in the soil. Few plants are more fastidious in their selection of a home than this thick-set, dark-green shrub whose every bough and stem is spiked with leaves from top to bottom. It will grow only where it likes, and with every change in soil or climate it makes some change in its appearance. Sabar and Hirwa are two little villages in the Taiz district, separated only by a small hill; yet next to Bokhari the khat of Sabar is the finest in the Yemen, while that of Hirwa is coarse, thin in quality, and more astringent in taste. Set out Sabari plants in Hirwa and they quickly become coarse; remove Hirwa plants to Sabar and they grow sweet and delicate.

ITS CULTIVATION IS SIMPLE

Bokhari is the sweetest of all khat and by far the most expensive. The supply is so limited that it is never seen except among the richest merchants of Zebide, Ibb, Taiz, and Sanaa. The commonest kind is Moqtari, which grows in the district of Makatra, about four days' camel ride from Aden, and most of the 2,500

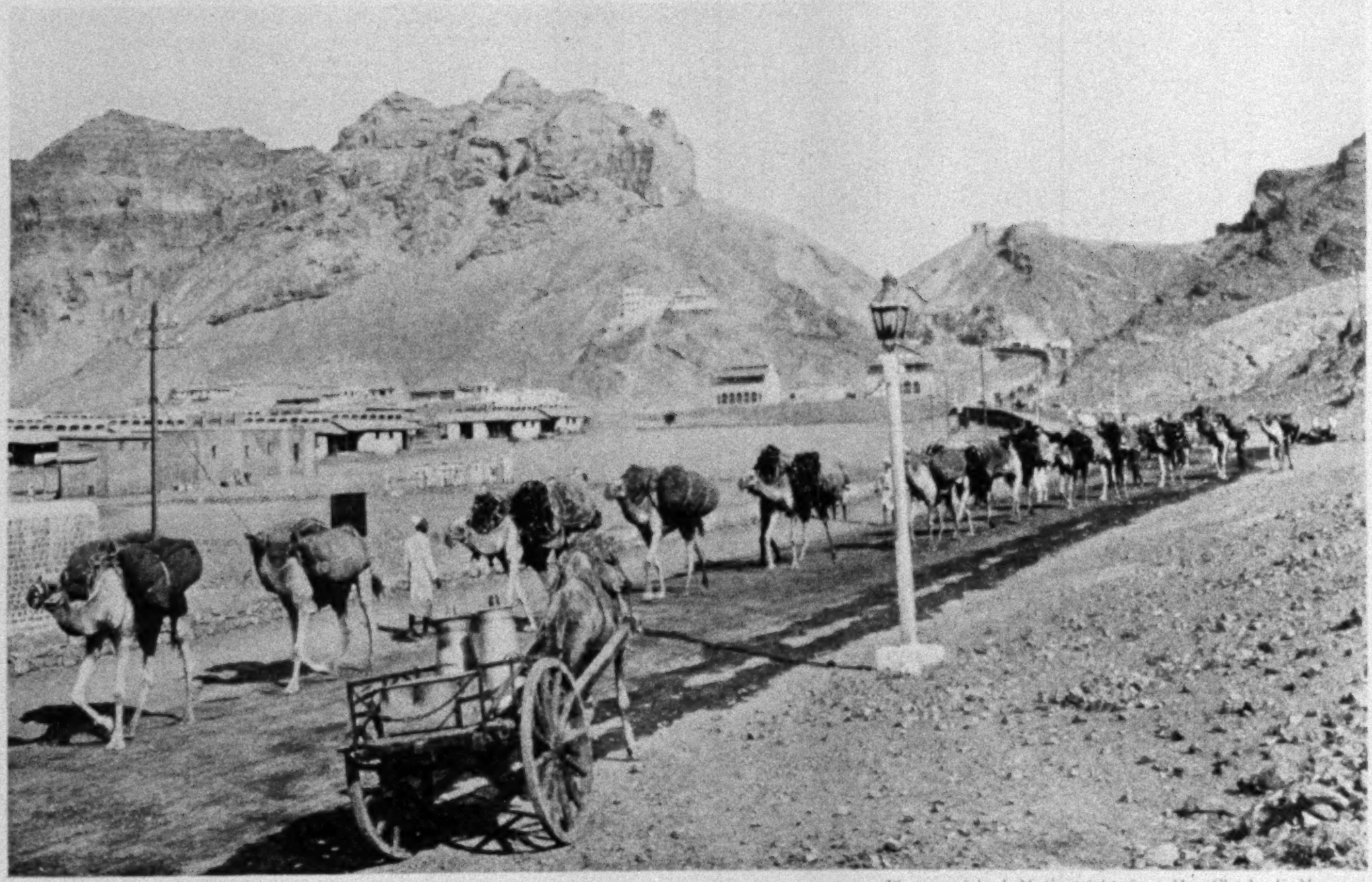


Photograph from Charles K. Moser

BUNDLES OF KHAT READY FOR THE AUCTIONEER

After the leaves are weighed on government scales and duly taxed, they are tied in bundles the thickness of a man's forearm. Then the sellers mount a table and auction them off. Each bundle fetches its own price.

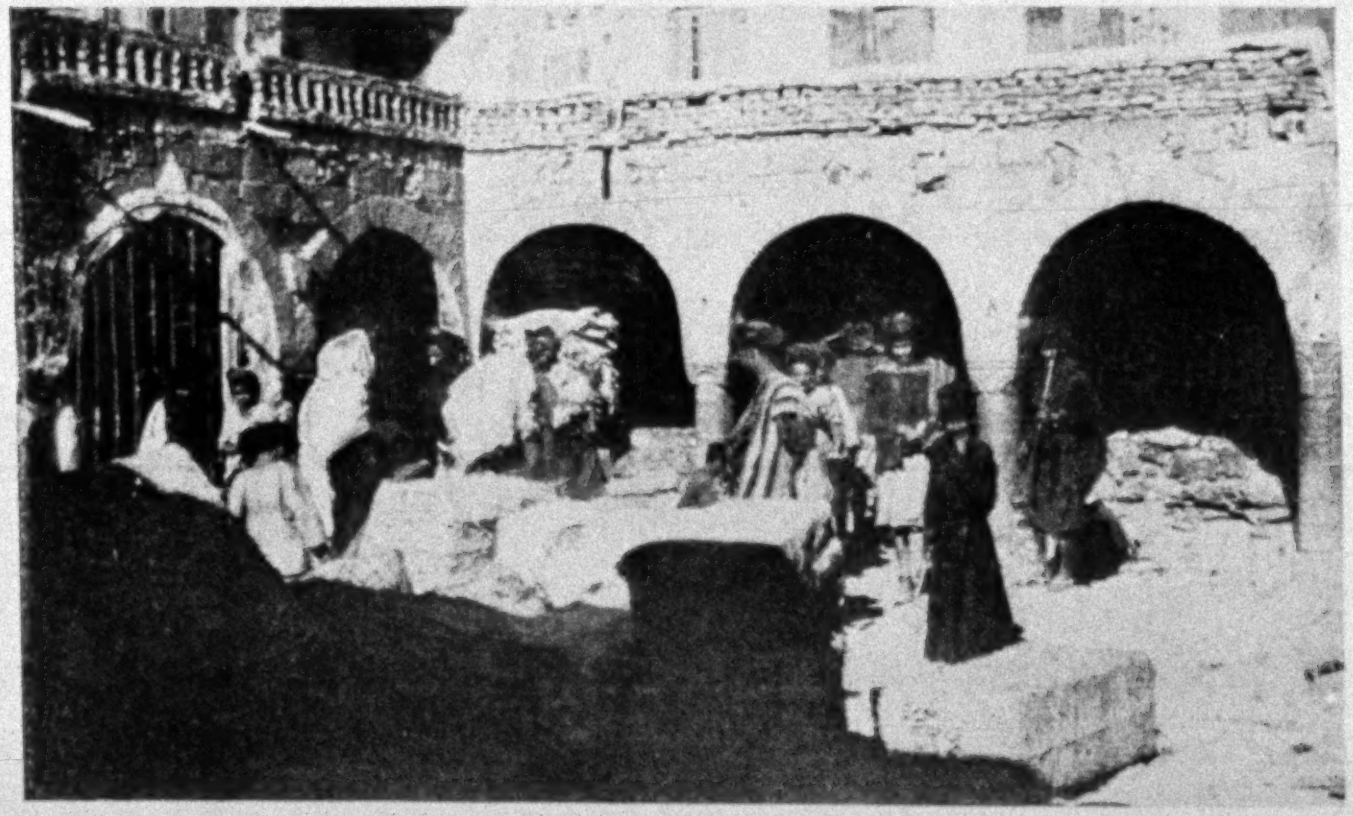
XUM



Photograph by J. M. Contrichô, from Mrs. Charles K. Moser

LONG, SNAKY CARAVANS FROM THE KHAT PLANTATIONS OF THE YEMEN INTERIOR

The Chinaman woos his "white lady," the poppy flower; the East Indian chews bhang; the West African delights in kola; the Caucasian indulges in wines and other alcoholic beverages. The Yemen Arab eats khat, which is not a narcotic, wooing sleep, but a stimulant like alcohol. Unlike alcohol, however, it conceals no demon, but a fairy who transports the devotee on wings of delight to realms of fancy.



IN THE KHAT MARKET-PLACE BEFORE THE HOUR FOR AUCTION

Shrewd youngsters meet the khat caravan at the city gate. These urchins have been bribed by the proprietors of the various bazaars to learn the relative quality of khat with which each camel is loaded. They are the spies and scouts upon whose reports will depend the liveliness of the bidding in the market-place.

Photographs from Charles K. Moser

AFTER THE SALE OF ALL THE CHOICE KHAT THE DESPISED CASTES ENTER THE MARKET-PLACE TO BUY THE REFUSE FOR A FEW PICE

camel-loads of khat which reach Aden in the course of a year is of this variety. Other varieties are: *mathani*, so called from the word meaning *double*; *mubarrah*, which, unlike any other variety, bears its leaves widely separated; *gaashani*, which puts forth leaves only at the top of the naked stem; *mooli* and *baladi*, the latter being any variety which grows wild on inhabited mountains, the word meaning "my place" or "my country."

Khat cultivation is simple. The plant bears neither flowers nor seeds, but is grown from cuttings. After the farmer has flooded his field till the soil has absorbed its utmost of water, he covers it with goat droppings and allows it to "ripen" for a few days. Then he buries the cuttings in shallow holes from 4 to 6 feet apart, with space enough between the rows for pickers to pass. But the Yemen cow and the sad-eyed camel, whose maw is never filled, have a nice taste in khat cuttings, and to discourage these marauders the farmer covers each hill with thorn twigs and spiny cactus leaves. Sometimes he trains one of the half-wild dogs which infest the village to guard that particular field. Thereafter that dog has but two ambitions in life—to catch some trespasser by the nose and to steal the rest of his *khana* (food) wherever he can.

At the end of a year the young shrubs are two feet high with a thickly spread green foliage 18 inches in diameter. Behold now the farmer going out into the dawn of each morning to gaze at his field and the sky in the hope of seeing the portents of harvest time. On a morning the air is thick with bulbuls, sparrows, weaver birds, shrilly clamoring. They rise and fall upon his plants, picking at the tenderest leaves. "Allah be praised!" cries the simple farmer, "the leaves are sweet and ripe for the market."

And now he calls his women and the wives of his neighbors to the crop-picking. Under a bower of jasmine vines, with plumes of the sweet-smelling *rehan* in their turbans, the farmer and his cronies gather to drink *kishar* from tiny cups and smoke the *hubbuk*, while the womenfolk bring them armfuls of the freshly cut khat leaves. What a joyous time it is for all the village; for always the farmer distributes the whole of his first crop among his neighbors, in the name of God, that Allah's blessings may thus be secured on all the succeeding ones.

The khat plant grows from 5 to 12 feet in height and then it stops. As the foliage thickens, the larger branches are pruned out to prevent crowding, and when the plant is 16 years old the top usually dies. It is cut off about a foot above the ground, and from the stump new shoots spring out and the plant is reborn.

WHEN THE CARAVANS ARRIVE

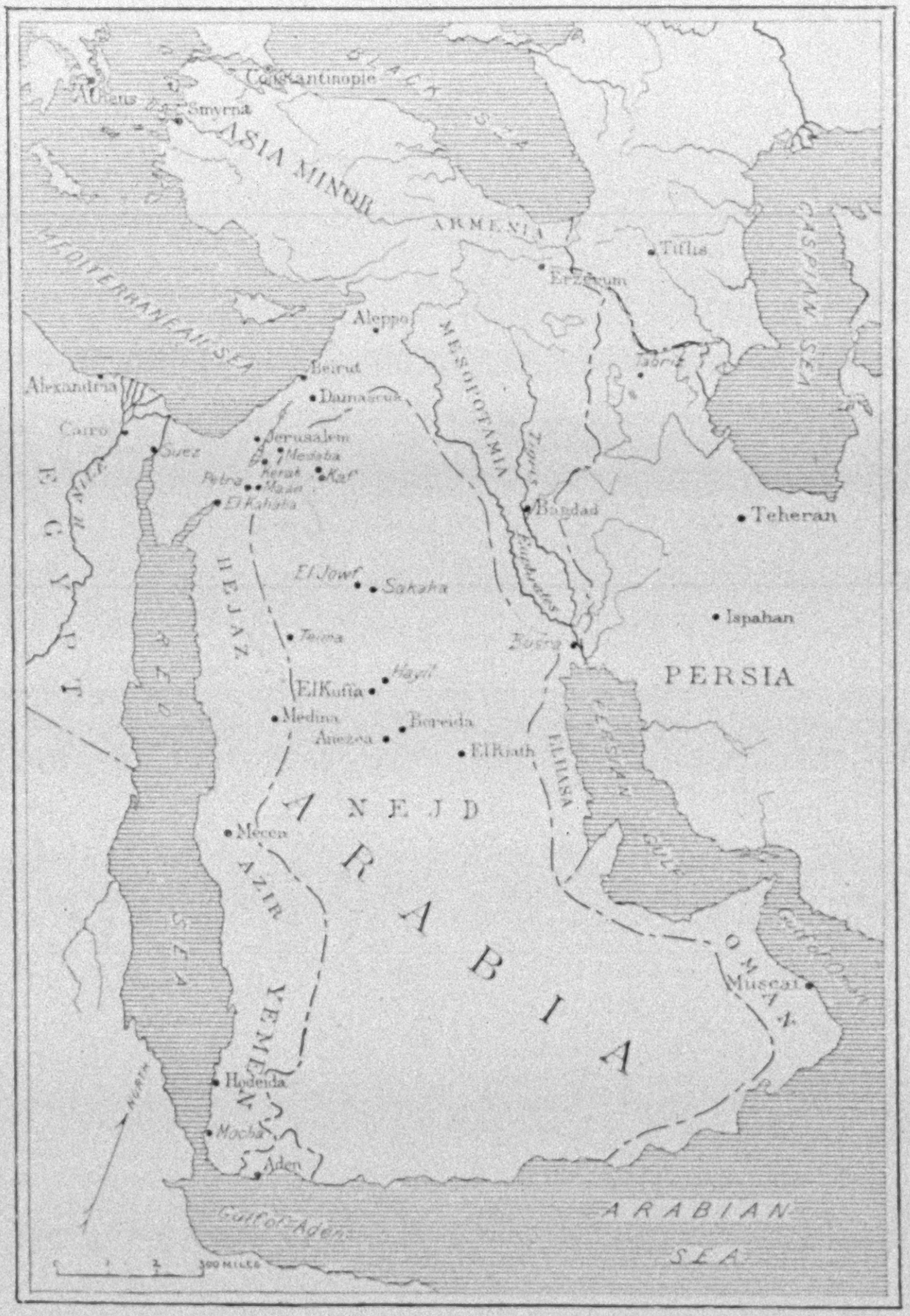
About 11 o'clock in the morning the khat camels come winding leisurely along the isthmus road from the interior. In the shade of the rock by the barrier gate stand two little black policemen to receive the tax receipts that were given the drivers at the British frontier. The huge brutes halt before the door of the low kutcha-thatched inn to pick at some wisps of dried grass, while their masters go inside to have a pull at the hubbuk and a drink of kishar or, maybe, a bowl of curds. Meanwhile a flock of shrewd youngsters, each with a lump of coppers tucked into his waistcloth, flit about the loaded animals, seeking to steal a leaf or to thrust an appraising glance into the closely wrapped bundles. "What, O *kowasji*, is the quality of your khat today? Which beast carries the best, and has thy driver stinted no water on the journey to keep it fresh?" To find true answers have these urchins taken their bribe money in the bazaars; but the barefooted policemen chase them away, the refreshed drivers come out, fiercely breathing calumnies against the grandmothers of such brats, and the little caravan picks its way upward toward the pass.

Long before it has dropped down into the crater bowl the bazaar has heard of its coming. From the dark shops, so silent but just now, cheerful cries break out; the streets are filled with singing and a stream of lean figures all headed one way. They are going to the khat market. Tikka gharries rattle madly by,

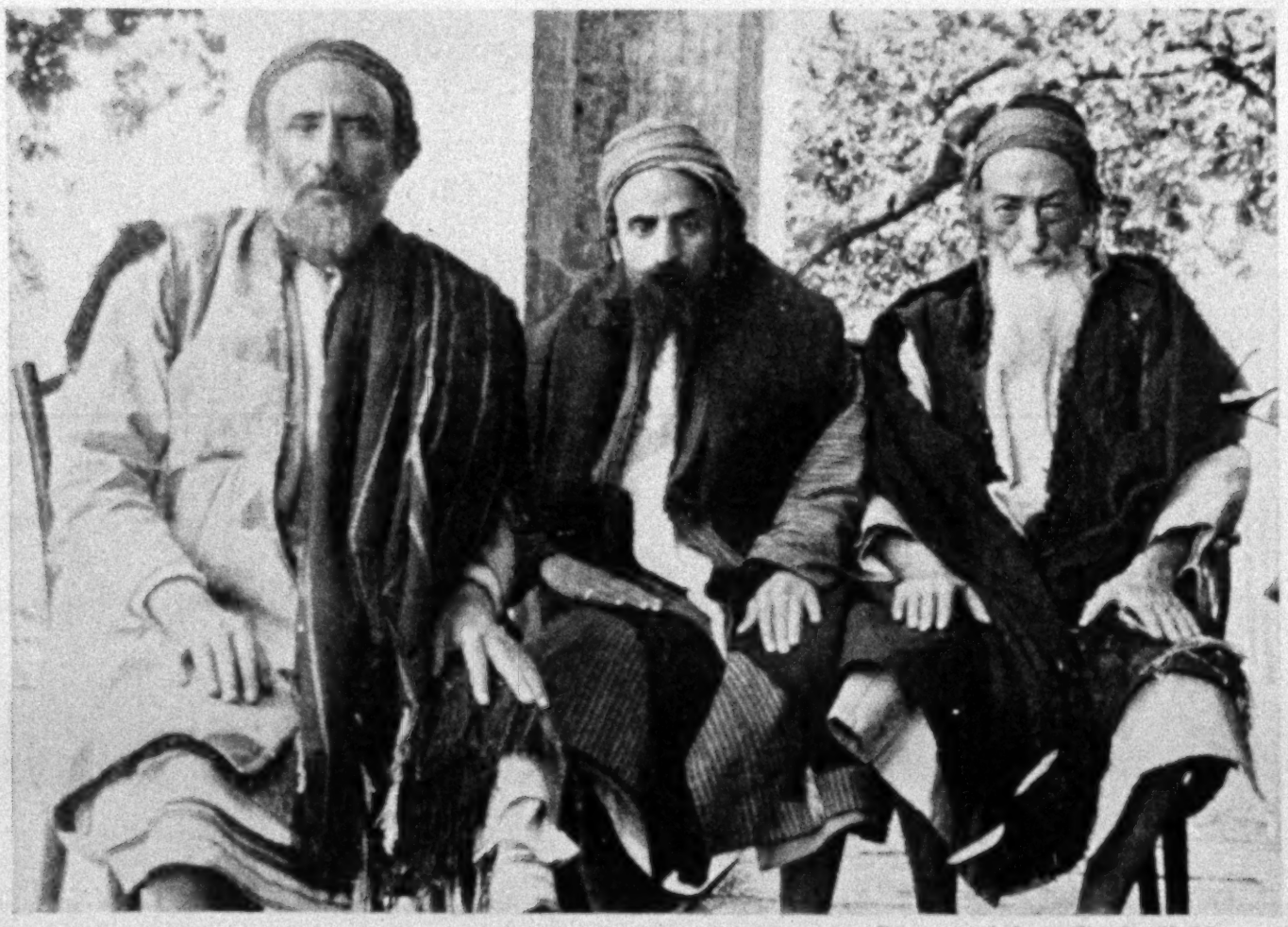
Photograph from Charles K. Moser

A FAMILY OF "KHADEM," OR OUTCAST ARABS

The mother and daughters are dancing girls; father and son are the despised sweepers or garbage men



OUTLINE MAP OF ARABIA



Photograph from Charles K. Moser

THREE WISE MEN OF ARABIA

Merchants and scholars of Aden may be crotchety in the forenoon, but after they have partaken of their daily sprig of khat they are genially personified, and any one of them would buy your horse for the price of an elephant.

whips waving and turbans awry; there are flashes of color from rich men's gowns, as they hurry to select the choicest morsels, the clack of oryx-hide sandals, and the blunt beating of tomtoms. When the camels arrive, the market is filled with a restless, yelling mob. Bedlam has broken loose, but it is a merry, good-natured bedlam.

LIVELY SCENES AT THE AUCTION

After the khat is weighed on the government scales and duly taxed again, it is divided into bundles the thickness of a man's forearm. Then the sellers mount tables and auction it off. Each bundle fetches its own price. *"Min kam! Min kam!"* cries the auctioneer, waving a bunch above the outstretched hands of the crowd. "How much! How much! will you give for this flower of paradise? 'Tis sweet as a maiden's eyes; 'tis like bees' breath for fragrance; 'tis—"

"One anna" (two cents) yells a contemptuous voice.

"Thou scum! O thou miserable little tick on a sick camel," shrieks back the seller, "may my nose grow a beard if it is not worth two rupees at the very least."

"Bismallah! There is not two rupees' worth in all thy filthy godown, *budmash*."

So go auctions the world over. Back and forth they hurl revilings, other voices break in with farthing bids, and the "flower of paradise" sells at last for six cents. Sometimes two merchants fancy the same bunch of sabari. It is worth perhaps a rupee, but they bid the price up and up till every one else stands by to keep the fires of their rivalry alive with cheers. Finally one is silent, and the other, crowing like a cock over his victory, pays his six or maybe ten rupees and passes out with the prize under his arm.

In an hour the place is all but deserted and the foot-marked, earthen floor littered with debris. Now come the hadjis, the venders of firewood, all the despised castes, like scavengers, to buy the refuse

for a few pice. But out in the streets may be seen hundreds happily wending homeward, a bundle of the precious leaves under each arm, their jaws working and their eyes full of a delicious content. It is close on to noon, and you will not see them again until after 2 o'clock.

Go to the house of a Mohammedan merchant (the Jews and other sects do not use khat) between those hours and say that you have urgent news for him, or that you have come to buy a lakh of rupees worth of skins. His servant meets you on the veranda and is very sorry. Master is unutterably sick (here he begins to weep), or his sister's husband's aunt's mother died this morning and he is doing no business, or certainly he has gone to Tawahi, but will assuredly be back by 3 o'clock. Will the sahib wait? At that very moment your friend is in the *mabraz* at the top of the house, smoking his hubbuk and chewing khat leaves, and he will not be disturbed.

Of course, if you are so lucky as to be on *very* friendly terms with him, you may be allowed to go up. Then, whatever your news, it will not shock him, and you may buy his goods at your own price. I went into the house of the merchant Abdul Kadir Mackawi and was taken up to the *mabraz*, where he and his revered uncle sat catching glimpses of Allah's rose gardens. He allowed me to take a photograph, and when I came away he gave me a pot of honey. I know now that Abdul Kadir Mackawi is my friend indeed.

Photograph from Charles K. Moser

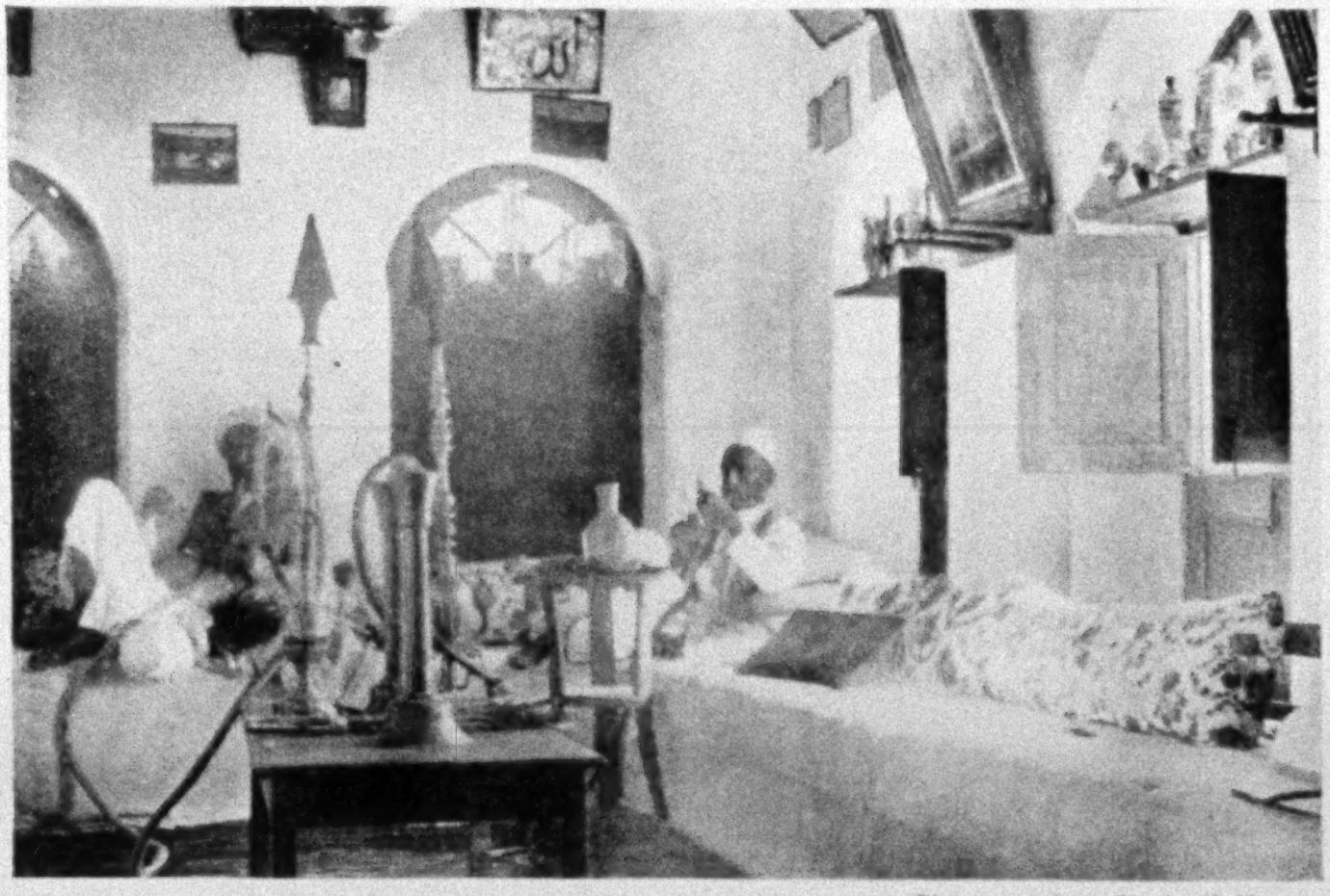
THE BOWL WHICH CHEERS BUT SELDOM INEBRIATES

With a loaf of bread and a bowl of khat, your Arab, unchivalrous though the confession be, needs no "thou" beside him to make his wilderness a paradise enow, Omar Khayyam to the contrary notwithstanding.

MABRAZES, THE PUBLIC CHEWING HOUSES

In Aden the mabrazes of the rich are private and often furnished with oriental luxury. Among the Somalis and the commoner Arabs the mabraz is a well-ventilated room, hired and furnished for their favorite diversion. The habitué of the public mabraz leaves his house at the appointed hour with his khat tied up in a bright shawl and conspicuously displayed; he wishes all the world to know that he goes to enjoy himself. In the mabraz rugs have been laid on the floor and pillows arranged against the walls. Each man can occupy the space belonging to his pillow and no more. By his side is placed the tall narghili, or hubbuk, of the East, two water pots or chatties on copper stands, and a bowl of sweets. When the mabraz is comfortably filled with customers, a servant lights the water pipes, some one produces the Koran or commences a story, and the afternoon's pleasure begins. Occasionally the *tarabs* (a kind of three-stringed viol) are played for the amusement of the guests, instead of readings from the sacred books; also it happens at times that a favorite singer is present. Whenever the listeners are particularly pleased, which is not infrequent, they interrupt the music with loud shouts of *"Tai-eeb!"* or *"Marhabba! marhabba!"* which is to say, "Good!" or the more approbative, "O friend, excellent indeed!" In these days it is not uncommon to find phonographs in the public mabrazes dispensing the classic songs of Egypt.

But the coolies, the bhisties, or water-carriers, and the hadjis are not found in the mabraz. You will see these despised ones in the humbler coffee shops, sitting on charpoys in a circle, each with his little



Photograph from Charles K. Moser

THE CLIMAX OF ARAB CONTENTMENT

The Yemen prototype of Honest Jack Falstaff takes not his ease in his inn with a flagon of sack to soothe and sustain him, but in his mabraz, where, with the aid of juicy khat leaves, he catches glimpses of Allah's rose gardens. The public mabrazes are not so luxuriously furnished as the private establishment shown here. They correspond to the taverns of the western world or the coffee-houses of the eighteenth century.

water chatty beside him, and in the center of the circle two or three *mudaheen* (street beggars) singing their loudest. When the khat is finished each guest pays the shopkeeper a half penny and does not forget to throw a pice to the mudaheen.

In Aden, khat chewing also takes place in the evening, after sunset prayers have been said. The evening scene differs from that of the afternoon only in the flaring lamps and candles and the red glow from smoking narghilis that throw into black relief the recumbent figures on the mabraz floor. If the mabraz is of the Syeds, descendants of Mohammed, there is no music, but only the droning sing-song reading of tales about the old prophets and the glory of Islam.

Khat customs differ somewhat in the different towns of the Yemen. In Hodeidah only the lower classes, the servants of European merchants, and the girls who hull coffee berries chew khat before 4 o'clock. This is the "official hour" when native business ceases. Charpoys, water pipes, and sweetmeats are brought out into the shade before the street door. The men of the household and their male friends sprawl sociably on the charpoys, the ingredients for the promotion of goodly fellowship ready to their hands. A graybeard sits in their midst expounding from the sacred book, or conversation lively in character, but subdued in tone, entertains the company. The aged, the palsied, even the dying, are brought down on their beds from the top of the house to partake of this feast of reason and flow of wit. Inside the latticed windows the women sit, munching the second best leaves and listening to the scraps of wisdom that float to them from the company below. At Sanaa, where the climate is always delightfully cool, there is no interruption of business for khat chewing. During all hours of the afternoon the busy merchant picks heedlessly at the green bundle beside him, and a cud of much proportion constantly wads his cheek.

No Yemen wedding would be complete without khat. When I asked my Arab boy what part it played in the marriage feast, he wrote out his version of the matter in (his) English for me. As I am sure he did it better than I can, I take the liberty of quoting his version here, verbatim:

THE PART KHAT PLAYS AT A WEDDING

"From 12 at noon all the people invited will begin to come, not in crowds, but by threes and two, into the makhdara. The seats inside here for the people to sit on are long pieces of rafters resting on empty cases of kerosene oil and laid with beautiful carpets and pillows. They collect the pillows and carpets from their relations and the empty kerosene cases from the shopkeepers. Madayeh, or water bubbles, are also ready; but rich men like to bring their own to show off. Lot of little water chatties are also kept ready filled, and lot of murbkhs (firepots) will be seen outside the makhdara with a dozen boys, fans in hand, ready to refill with tobacco and fire on the first call of "Ya yi-yall!" or "Boys!" Rich people will be seen nicely dressed, umbrella in hand, fine shawl on shoulder, a boy after him with the bubble, little cock-shaped water jettie, etc., on their way to makhdara. Reason why rich people like to get everything from home is that all things they use for khat eating are specially made and very amusing, so they like to be proud of them in large assemblies.

"Well, when the makhdara is full up, khat distribution will go on and khat chewing begins. The way how they distribute it is that as soon as a man has come in the marriage makers will politely come to ask him whether that man is rich or poor and take him to a seat where they will make him sit and put a bunch of khat in his hand. About 1 o'clock the tarab man with his company will be seen going to the makhdara. A special place wide enough to seat ten men is provided for them and the bridegroom sits among them. And now the singing begins. On this occasion two tarab men play, and one little drum, the songsters being the tarab men only. Suddenly noise of falling rupees is heard, and by finishing time in the evening hundreds of rupees may be seen gathered. All this is for the tarab men.

"Just at 4 o'clock 'Asha,' evening food, will be ready. As soon as the food will be brought in nobody will touch it till one of the relations of the bridegroom will shout out, 'Bismallah!' or 'Begin in the name of God.' Suddenly they will all be seen got up with the Asha (usually fried rice with mutton or mutton pillau) hardly touched. Well, it is a rotten custom among the Arabs on marriage ceremonies that as soon as one has got up all will follow him, and they never be eating more than two minutes. The custom among the Indians is quite contrary to this. They when they have finished what is brought to them will not get up, but shout for more till their bellies are quite full. Now, again, sounds of rupees will be heard the second time, when they will be found washing their hands and coming out of the makhdara. All this money now collected goes to the father of the bridegroom. The same thing what happened in the afternoon takes place at night. The next morning piles of khat branches and rotten leaves may be seen outside of the makhdara."

NEVER USED AS A BEVERAGE IN YEMEN

Contrary to the general opinion held by those who pretend to know anything about it at all, khat is *never* used as a beverage in the Yemen, but the fresh leaves are invariably *chewed*. The youngest leaves are the best. They have a sweetish, slightly astringent taste, not unpleasant to the European palate, but certainly not alluring. When brewed, they lose most of their strength and the flavor of the decoction is much like that of those grapevine "cigarettes" which most of us enjoyed (?) in boyhood days. The old leaves are tough and ought to tan a leathern tongue.

Just what is the exact toxic effect of khat on the human system has never yet been ascertained. It is certainly a stimulant with a lively and nearly immediate effect upon the brain and nerve cells; the gloomiest man becomes cheerful under its influence, the most enervated active.

XUM

Withal, I have been unable to learn of a single case of immediate or harmful reaction such as invariably follows the use of other stimulants. It is true that excessive indulgence in khat, especially on the part of the novice, produces a sort of intoxication, with symptoms similar to those observed in alcoholic cases. The victim staggers, his speech becomes foolish, and he acts as if in a sort of amiable frenzy. Occasionally he has headache and nausea. But such cases are exceedingly rare and the symptoms invariably depart without leaving any apparent ill after-effects.

To the charge that khat eating affects the heart seriously, sufficient reply is returned when it is said that notoriously few Yemen Arabs die of heart disease, and yet they constantly perform feats which are supposed in civilized countries to put severe taxes on the heart's action. One great evil, however, that does result from long-continued and excessive khat eating the Yemen Arab admits, and the statements of Turkish doctors in the Yemen support him: it appears to cause impotency.

Nevertheless this singularly endowed plant deserves more consideration at the hands of science than it has been given. No one in the world would desire to introduce the khat habit into civilized communities, where there are too many similar habits already; but its power to alleviate suffering, to revive depressed nerves and strengthen exhausted muscles—without apparently giving rise to dangerous reactions—certainly suggests that if it were brought to close study and administered under proper control it might work magical benefits upon thousands of brain-harried and nerve-worn humanity. At least, a plant capable of giving so much pleasure to one people ought not work much disaster upon another.

THE AUTHOR'S SACRIFICE FOR SCIENCE

Once, filled with the fervor of sacrifice for science, I determined to try eating khat for myself; to get roaring, howling drunk on it—or catch those vaunted glimpses of a Moslem's paradise. My servant procured me a huge supply of leaves and I fell upon them hungrily, pencil and notebook in hand. For two hours I chewed. I reduced that pile of leaves to bits of stems and a few old-seasoned veterans, and then my tongue, harried like a hide in a vat, rose up in rebellion. It filled all my mouth with a protest so bitter that I had to surrender. Nothing had happened. But late that night I was still awake. The excited brain would not let me rest. Nerves and muscles ached for arduous tasks.

At last, determined to "walk it off," I slipped out of bed and went across the silent, dreaming town to where lights and faint strains of song told of a mabraz still open; and there, through the trellised windows, I saw old Raschid, the khat drunkard, with his red beard. In the midst of the somber, shadow-steeped figures he swayed, as though dizzy with the sound of his own voice, chanting the Song of the Khat Eaters.

AN APPEAL TO MEMBERS

Your attention is earnestly directed to the two-page announcement, near the third cover, of the desire to establish a National Geographic Society Ward in the American Ambulance Hospital, Neuilly, Paris, France.

There is a great need for this practical demonstration of preparedness, for the hazard to life and limb is to be reckoned with. Every member should be interested, and all contributions, small and large, will be welcome. There will be no overhead expenses incident to this fund. Every dollar will be expended for the purpose designated.

The dashing music of the world's greatest bands -on the *Victrola*

There's a sparkle and swing to band music that stirs the heart and arouses the enthusiasm.

You will be thrilled indeed by the band music that is brought to you on the Victrola—the music of the world's greatest bands!

Sousa's Band, Pryor's Band, Conway's Band, Vessella's Band, United States Marine Band, Black Diamonds Band of London, Band of H. M. Coldstream Guards, Garde Républicaine Band of France, Banda de Alabarderos of Madrid, Kryl's Bohemian Band. It is just like having these famous organizations actually parade before you.

Hear this inspiring band music at any Victor dealer's. He will gladly play any music you wish to hear. And he will demonstrate the various styles of the Victor and Victrola—$10 to $400.

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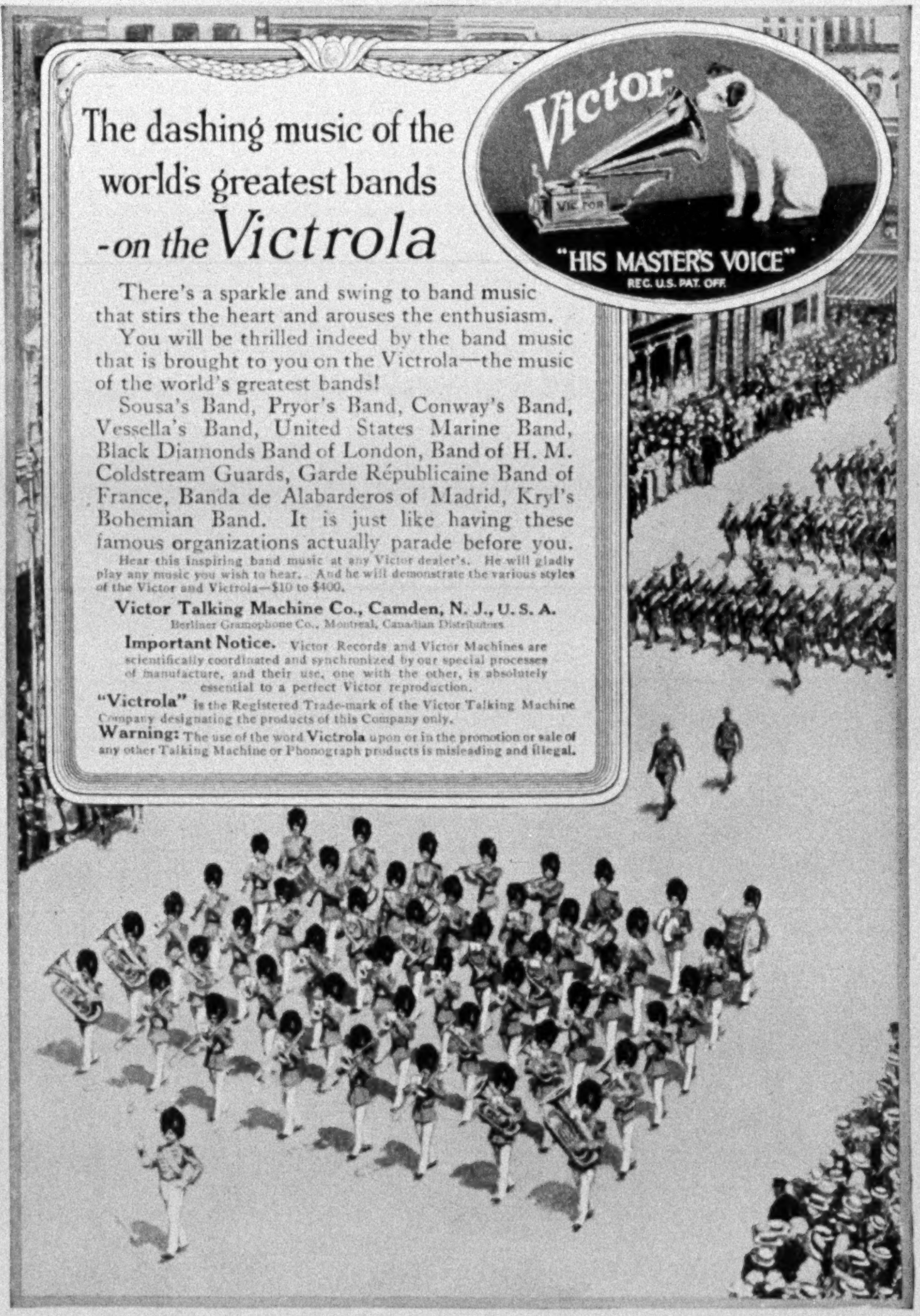
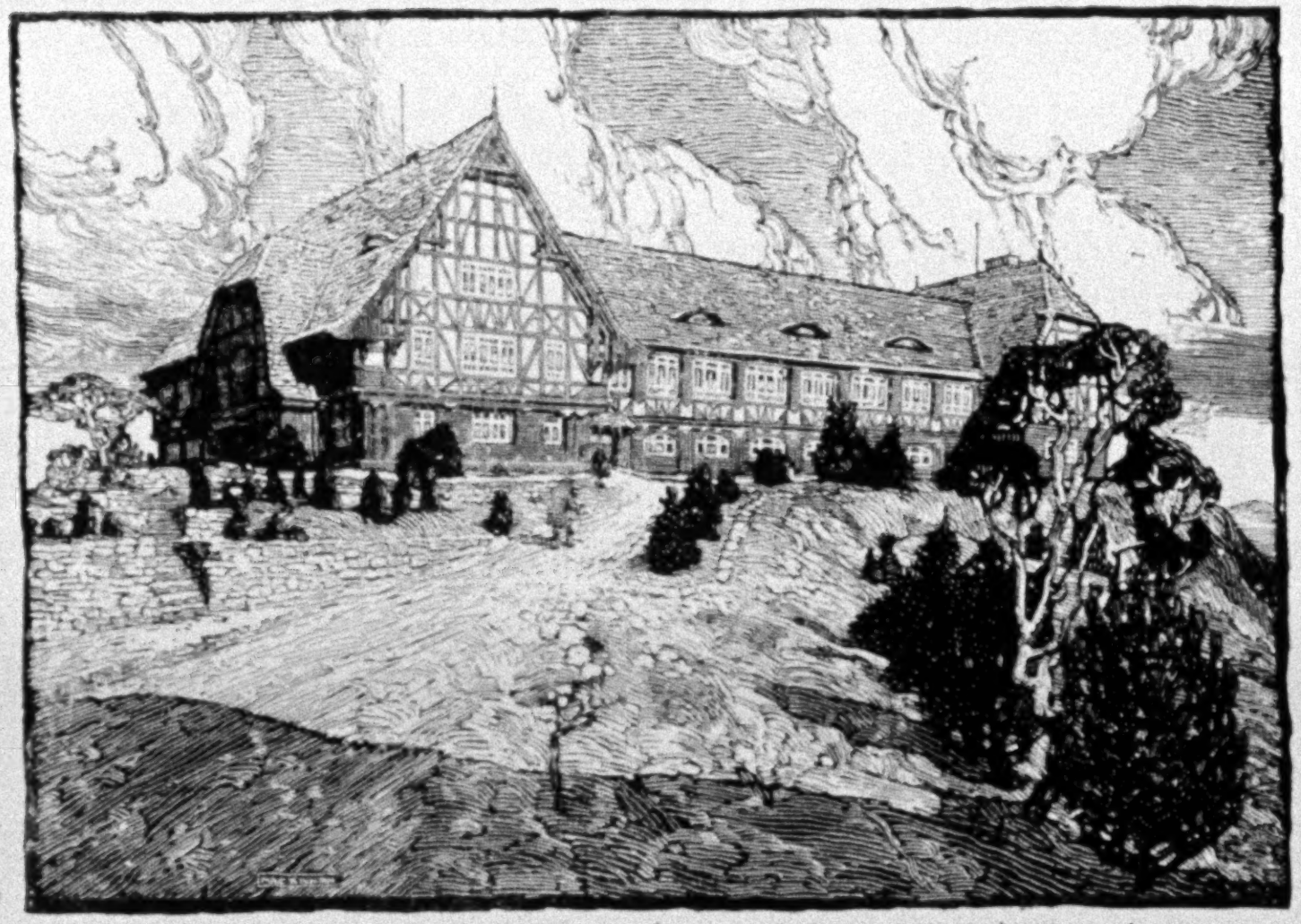


New Victor Records demonstrated at all dealers on the 1st of each month



This is a woodcut reproduction from an actual photograph (not a visionary drawing of a building) of the new American workshop of the Gruen Watchmakers Guild, on "Time Hill" near Cincinnati, U. S. A.

"A WORTHY COMPANY OF WATCHMAKERS"

How the Spirit of the Ancient Guild of Master Craftsmen is preserved in America today

IN SWITZERLAND, years ago, flourished companies of craftsmen, known as "guilds". Of these, the most powerful and the most famous was the Guild of Watchmakers, whose timepieces became famous throughout the world for their accuracy, beauty and durability.

In their charters we read that they were incorporated to practice the "mystery and art of watchmaking".

Watchmaking was a "mystery" then because only a chosen few of the most skilled artisans were admitted to the "worthy company", as the members of the guild styled themselves. And the secrets of the craft were jealously guarded. The members of the guild were picked men, who served long apprenticeships.

It was an "art" because the mem-

bers of the guild gave their lives to the production of beautiful timepieces.

With infinite care they fashioned by hand the fine old watches which now adorn the famous collections. They were proud of their work, these brethren of the ancient Swiss company, and they signed their watches as Rembrandt might sign a painting or Michelangelo a statue.

14TH CENTURY GUILD WATCHMAKER AT WORK

HOW GUILD SPIRIT IS PRESERVED BY GRUEN WATCHMAKERS

In America today, the old guild traditions of careful, perfect workmanship are preserved by a modern "worthy company"—the makers of the Gruen watches.

The Gruen horologists have done much to improve the mechanism of the modern watch, their most important contribution to the art of watchmaking being the "Verithin" arrangement of the wheel-train, which makes possible "an accurate watch made thin."

The watches they make are unequalled as timekeepers, and as examples of craftsmanship.

In Madre-Biel, Switzerland, they make the Gruen movements. In a picturesque, new work shop on "Time Hill," near Cincinnati, beautiful cases are designed and made. Here the movements are adjusted and tested. Here, too, duplicate parts are kept on hand, and the Gruen is one Swiss watch which can readily be repaired in this country.

The new workshop of the guild on "Time Hill" preserves the medieval guild atmosphere in its design and its spirit. Its lines suggest an ancient Swiss chalet. It is of tapestry brick, and half-timbered stucco, with a gabled roof of green tile. It is ideally situated on a hill of Alpine loveliness, covered with firs, edelweiss and Swiss shrubbery. There is a waterfall among the rocks.

In the artistic, sunlit workrooms, there is a quiet, unhurried air, that makes for concentration and the production of beautiful things.

It is a pleasant place where men give time and thought to their work, and where timepieces are wrought with the painstaking care and veteran skill of the men who wore the watchmakers' livery in the days of the ancient guilds.

It is natural that such an institution, actuated by such spirit should produce a watch as superior to an ordinary watch, as a wonderful Oriental rug is to a common, domestic rug.

THE STORY OF THE "WORTHY COMPANY OF WATCHMAKERS"

An interesting book, illustrated by a famous etcher, has been written

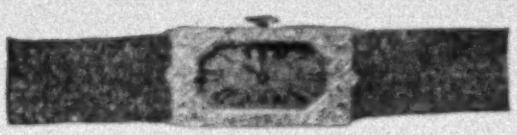
about the modern "worthy company," its workshops and its products. It describes fully all the Gruen models. It is a book on watches and watchmaking that should be read by everyone who intends to buy a watch. We will be glad to send it to you, if you will write for it.

WHERE GRUEN WATCHES MAY BE OBTAINED

The demand for these watches is so great, and the production necessarily so limited, that their sale is restricted to 1,200 leading jewelry stores in the chief cities of the country. If there is no Gruen representative in your community, write us, and we will be glad to arrange for you to see any Gruen model you are interested in

FIXED PRICES: VERITHINS, $27.50 to $200. ULTRATHINS, $165 to $250 DIETRICH GRUENS, $300 to $650 WRISTLETS $20 to $150; with diamonds, $125 to $1200. Highest perfection obtainable in grades marked "Precision."

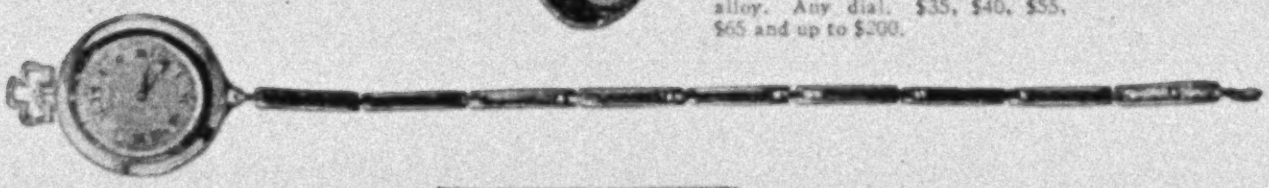
325—RECTANGULAR GRUEN DIAMOND PLATINUM RIBBON WRISTLET, movement rectangular shape, finest precision, 18 jewel grade. Price from $450 to $525. Many other odd shapes in gold and platinum from $35 to $850.



WRISTLET NO. 301. Round bas-cine case, 14 kt. gold bracelet. Made in solid gold, white, green or yellow gold alloy. $28—$100. In 25 year gold filled $18 to $25.

WRISTLET NO. 312. Chased, 14K, 9 ligne, Gruen movement. Gold bracelet. Made in white, green or yellow gold alloy. Also in octagon shape, $65. Precision grade 18 jewel, $115.

THE GRUEN VERITHIN. Plain, engine turned, engraved gold cases; also white, green or yellow gold alloy. Any dial. $35, $40, $55, $65 and up to $200.



How the pat. Gruen wheel construction made an accurate watch thin

"The Most Beautiful Watch in America"

GRUEN WATCHMAKERS GUILD, Dept. D-2 "TIME HILL" CINCINNATI, O.

Makers of the famous Gruen Watches since 1874

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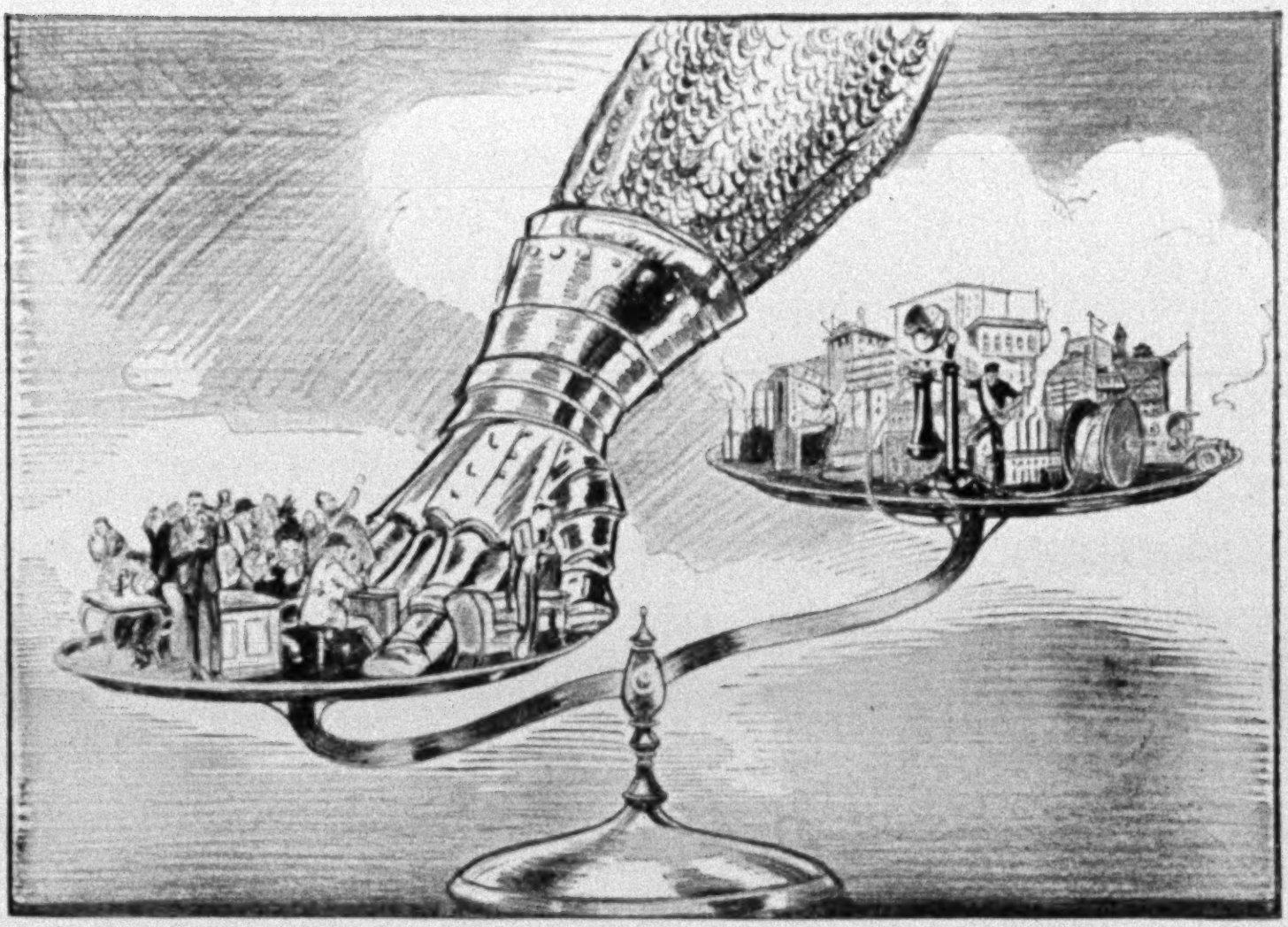

The Weight of War

The heavy hand of war has disturbed the balance between supply and demand the world over. Our problem of serving the public has all at once assumed a new and weightier aspect.

Extraordinary demands on telephone service by the Government have been made and are being met. Equipment must be provided for the great training camps, the coast-defense stations must be linked together by means of communication, and the facilities perfected to put the Government in touch with the entire country at a moment's notice.

In planning for additions to the plant of the Bell System for 1917, one hundred and thirty millions of dollars were apportioned. This is by far the largest program ever undertaken.

But the cost of raw materials has doubled in a year. Adequate supplies of copper, lead, wire, steel and other essentials of new equipment are becoming harder to get at any price, for the demands of war must be met.

Under the pressure of business incident to war, the telephone-using public must co-operate in order that our new plans to meet the extraordinary growth in telephone stations and traffic may be made adequate.

The elimination of unnecessary telephone calls is a patriotic duty just as is the elimination of all waste at such a time. Your Government must have a "clear talk track."

AMERICAN TELEPHONE AND TELEGRAPH COMPANY

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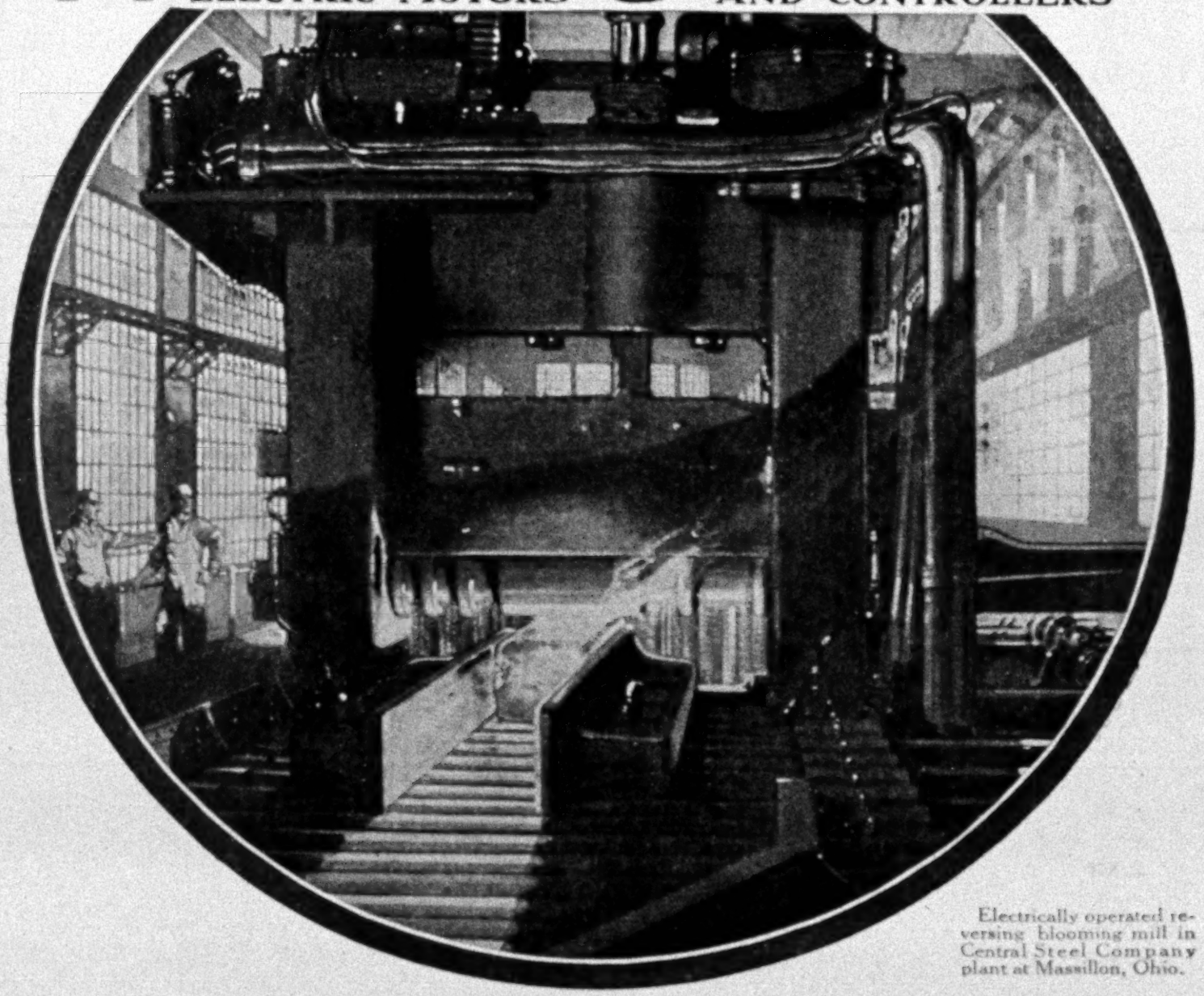
One Policy ***One System*** ***Universal Service***

"Mention the Geographic—It identifies you."

Westinghouse

ELECTRIC MOTORS AND CONTROLLERS



Electrically operated reversing blooming mill in Central Steel Company plant at Massillon, Ohio.

The Power Behind King Steel

Nowhere can one gain a more vivid impression of tremendous forces than in a modern steel plant.

The massive structure of a blooming mill, the ease with which it shapes the ponderous ingot, are amazing to the layman.

Yet, strangely enough, the force that drives the mighty mill is confined within the slender wire windings of the electric motor.

More surprising still, that force is created simply by the swift revolution of one part of the motor within another.

The revolving part, or rotor, moving in obedience to a magnetic pull that operates through the air-gap between the two elements of the motor, turns a massive shaft and rolls out the white-hot steel.

Westinghouse

ELECTRIC MOTORS AND CONTROLLERS

8000 h. p. Westinghouse Steel Mill Motor which drives the mill shown on the opposite page.

Electricity in the Steel Mill

The harnessing of this mysterious force has been a Westinghouse Electric task for many years. To electrical engineering, in large measure, the steel industry owes the efficiency with which steel is today manufactured, manipulated, and refined.

In that development, Westinghouse Electric engineers have figured largely. They have led the way in perfecting alternating-current and direct-current motors, motor-controllers, and meters of extraordinary accuracy, and in solving the vitally important problems of engineering raised by every complete installation.

Steel is King today more than ever, and the national crisis demands every aid to efficiency in its handling.

The results of our experience in connection with the largest and most advanced installations are at your disposal.

WESTINGHOUSE ELECTRIC & MANUFACTURING COMPANY
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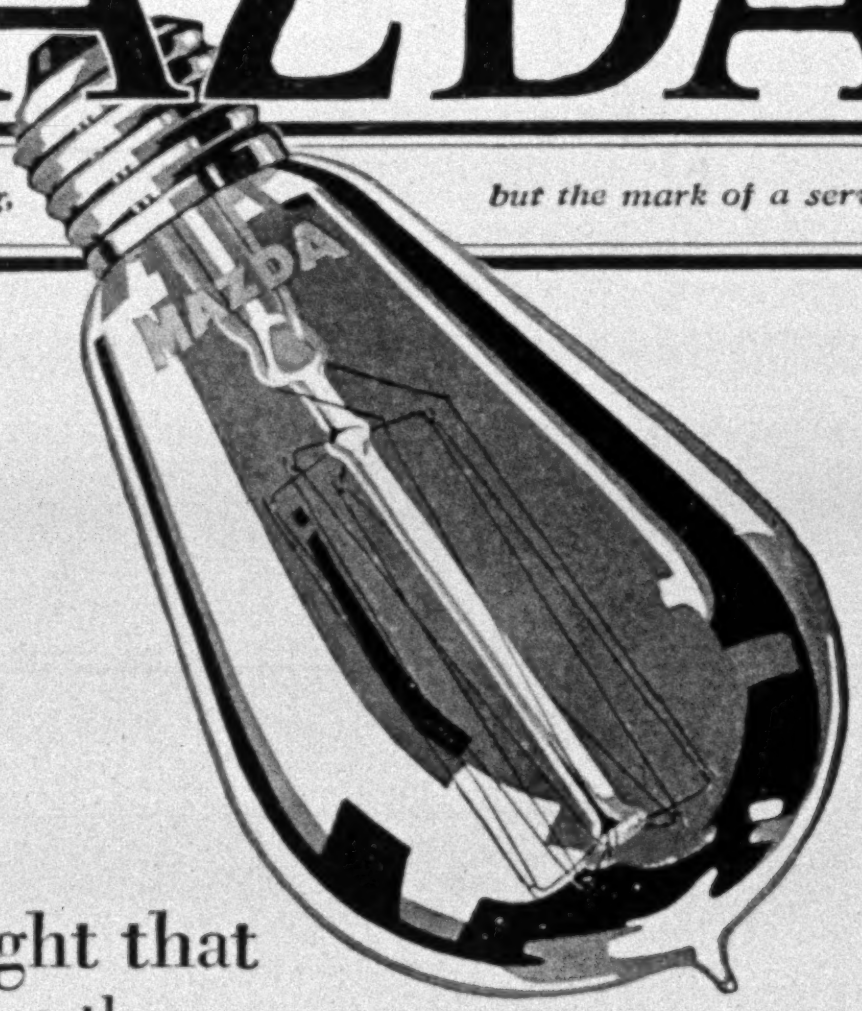

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MAZDA is the trademark of a world-wide service to certain lamp manufacturers. Its purpose is to collect and select scientific and practical information concerning progress and developments in the art of incandescent lamp manufacturing and to distribute this information to the companies entitled to receive this Service.

MAZDA Service is centered in the Research Laboratories of the General Electric Company at Schenectady, New York. The mark MAZDA can appear only on lamps which meet the standards of MAZDA Service. It is thus an assurance of quality. This trademark is the property of the General Electric Company.

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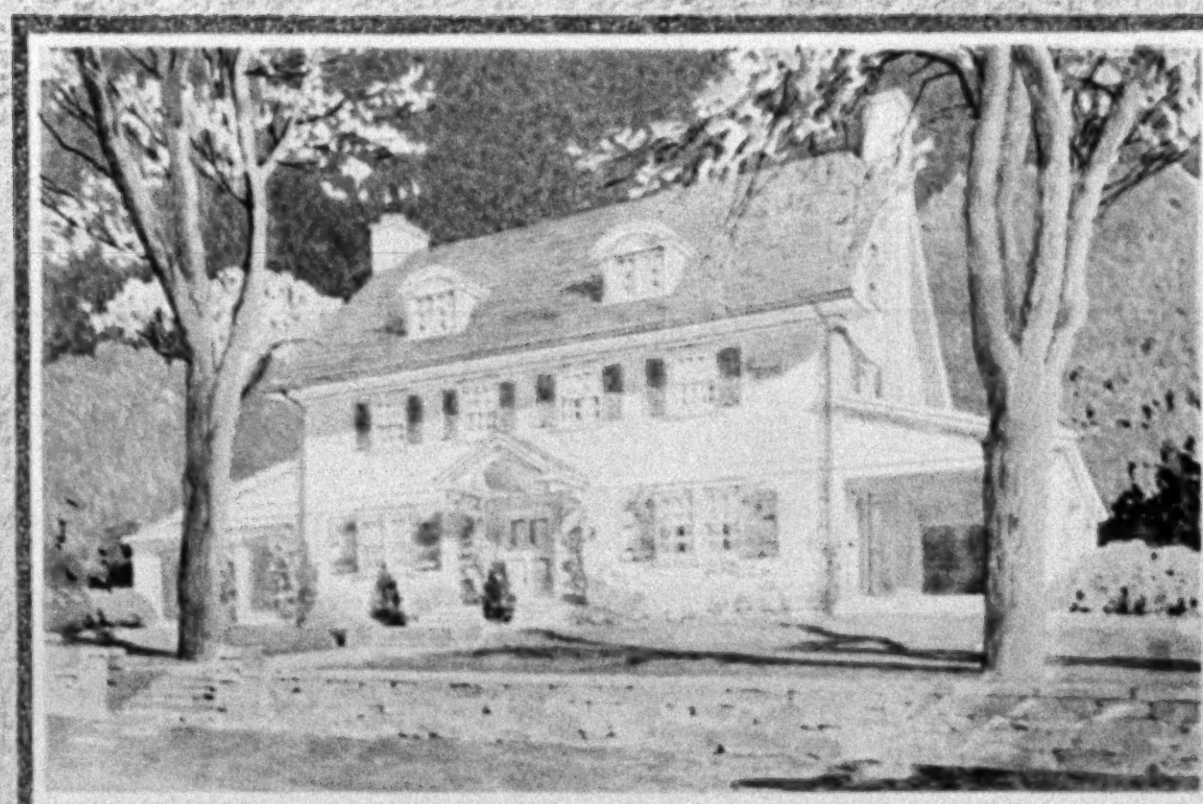

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The New Kind of Color Stucco adds to these advantages a delightful individuality and infinite variation of color, tone and surface. These effects are obtained at negligible cost by adding screenings of richly colored granite or marble or warm-toned sands or gravels to Atlas-White Cement; and the effects are as permanent as they are beautiful.

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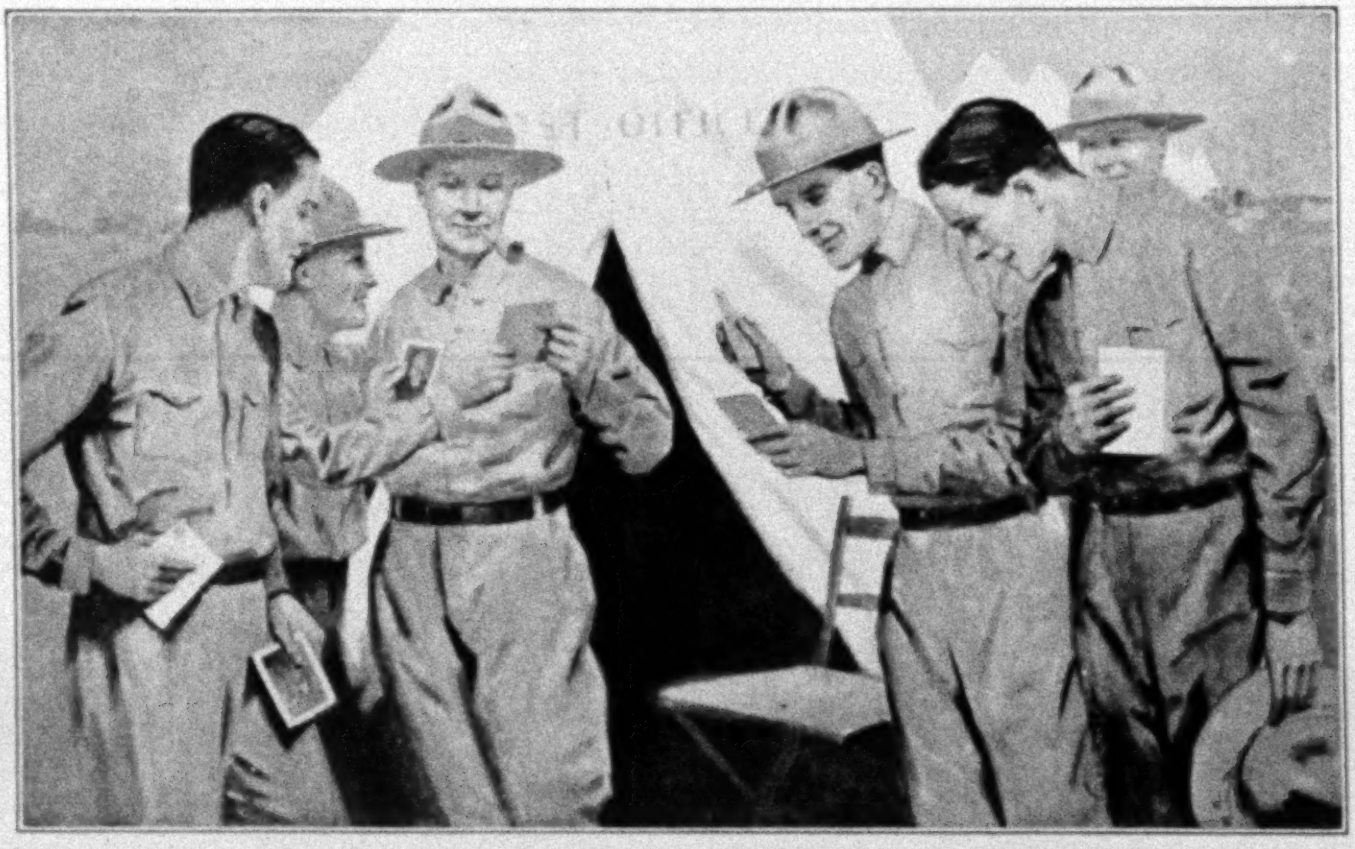
ATLAS WHITE

THE ATLAS PORTLAND CEMENT CO., 30 Broad Street, New York, or Corn Exchange Bank Building, Chicago. Send to name and address below book on Color Stucco. I am interested in Houses costing about $ _____ Garages costing about $ _____



Snap-Shots from Home.

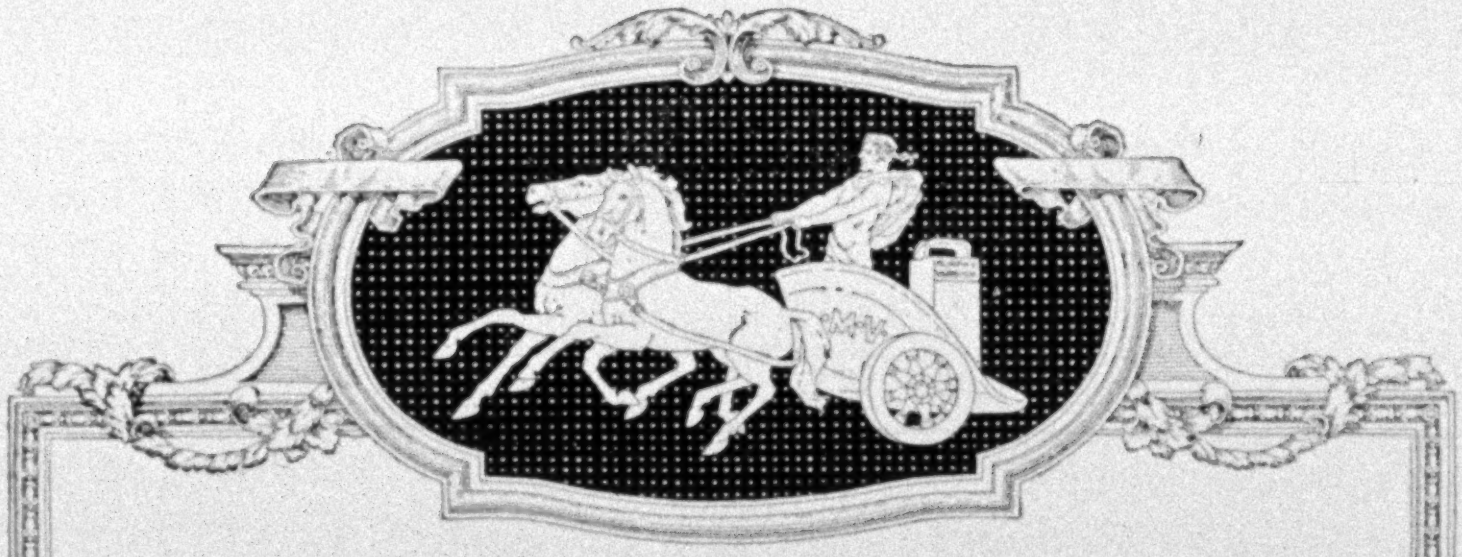
Give cheer to the boys in camp and on shipboard by sending them pictures from home. There are likely to be some tedious, homesick days and a little cheer-up in the way of photographs of the home folks and the home doings will do them a lot of good.

And some day when you want to give something a little more substantial, send along a Vest Pocket KODAK and ask your Soldier or Sailor Boy to send pictures to you.

Vest Pocket Autographic Kodak, - - - - - $6.00

All Dealers'.

EASTMAN KODAK CO., ROCHESTER, N. Y., *The Kodak City.*



Are you proud of your floors?

Can you look your floors in the face without a blush? Do they add to the orderliness and refinement of your home, or are they a thorn in your side?

Floors repay good treatment. They respond to good varnish. Your floors will stop making trouble and become a joy to your eyes if you will have them properly refinished.

Murphy Transparent Floor Varnish

"the varnish that lasts longest"

covers floors with a beautiful lustrous coating that takes all the wear and preserves the natural beauty of the wood. Murphy Floors are great trouble savers. A damp cloth or mop keeps them free from dust or lint. And they haven't the trick of slipperiness. Murphy floors are money-savers too; they need refinishing so seldom.

Your painter or dealer keeps our house-finishing products including

Murphy Transparent Interior Varnish
Murphy Transparent Spar Varnish
Murphy Univernish
Murphy White Enamel

Send for "Beautiful Floors," a serious book humorously illustrated which contains much you ought to know about floors and varnish.

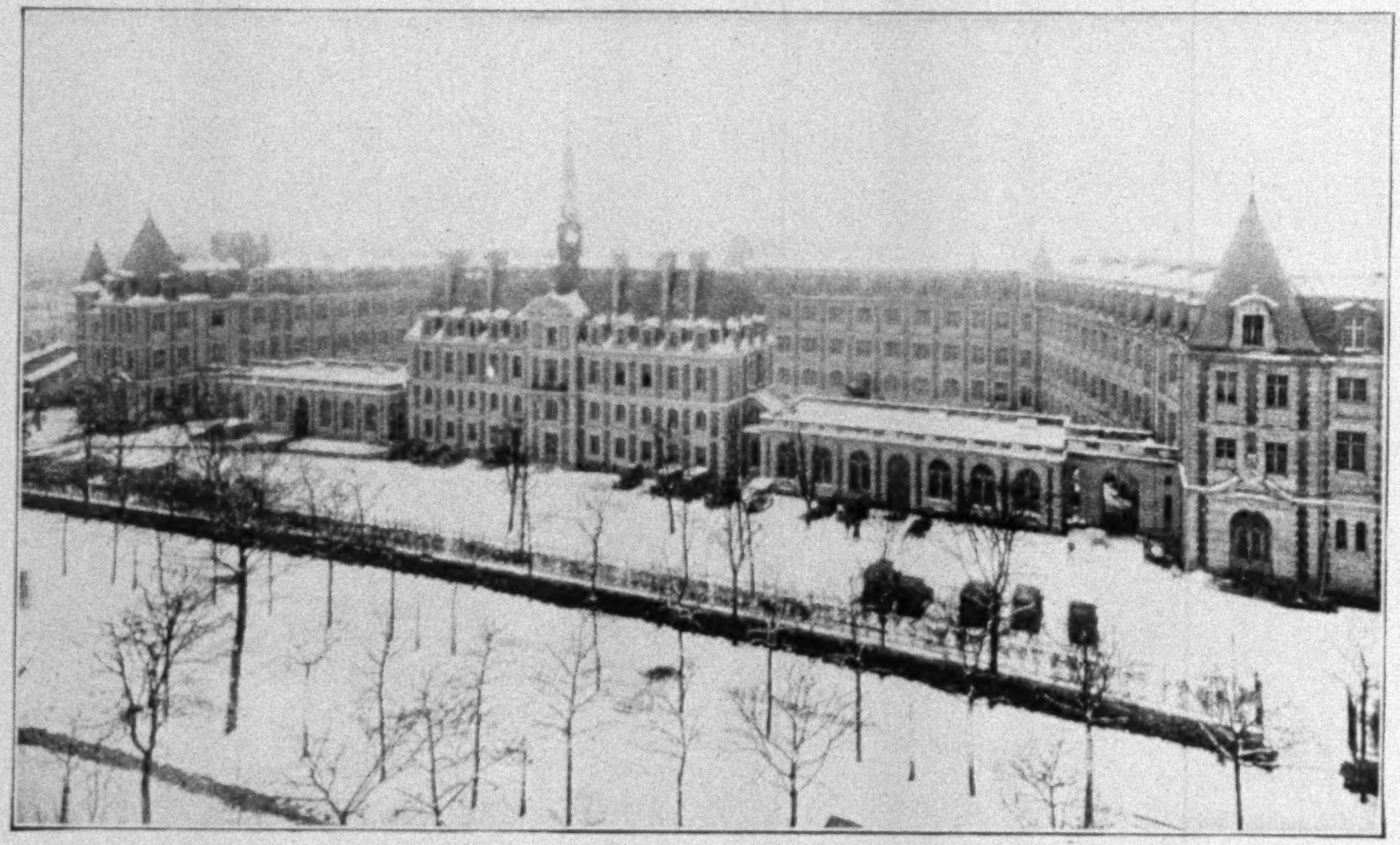
Murphy Varnish Company

Franklin Murphy, jr., President

Newark New Jersey — Chicago Illinois

Dougall Varnish Company, Ltd., Montreal, Canadian Associate

ANA



WINTER VIEW OF AMERICAN AMBULANCE HOSPITAL BUILDINGS, NEUILLY, FRANCE

In the troubled days that will surely come, each member of the Society will have cause to be proud of the help and personal interest given to establish the **National Geographic Society Ward** in this splendid American hospital for our sick and wounded soldiers carrying our flag "over there."

NATIONAL GEOGRAPHIC SOCIETY WARD

IN THE

AMERICAN AMBULANCE HOSPITAL

NEUILLY, PARIS, FRANCE

THOUSANDS OF MEMBERS of the National Geographic Society and the sons of a great many more have answered our country's call to arms. Numbers have already gone to France, and others will follow shortly to place the Stars and Stripes side by side with the battle standards of our allies in this titanic struggle for freedom and everlasting peace.

We should not close our eyes to the eventualities that confront our men in action and in camp, because the physical hazard is ever present. For the safe return of your boy or your neighbor's son you can but hope and pray; and yet there is something that you can do—a help that is both practicable and all important, which will reduce that hazard of life and limb and minimize the toll which wound and disease demand.

Will you do your part today and thus prepare for tomorrow? In the American Ambulance Hospital, located at Neuilly (pronounced Nuh yeé), in the environs of Paris, there should be established a

NATIONAL GEOGRAPHIC SOCIETY WARD (TWENTY BEDS)

Picture to yourself the feeling of one of our fellow-members or his boy upon being brought into this hospital and placed in a comfortable bed provided for him by his own friends. Can you imagine a better tonic or a more comforting thought to a sick or wounded man than the realization that he is almost at home?

The American Hospital at Neuilly, housed in a splendid four-story building built around the four sides of a beautiful court, now takes care of about 1,500 patients a day in its main and auxiliary hospitals. The average number of patients under treatment in the main institution is 454 a day, and these represent the most serious surgical cases. During last year 5,100 serious operations were performed, 135,000 patients were transported in the hospital's ambulances, and the war-harried people of every hamlet within the boundaries of brave France heard of the profound sympathy of America for their trials and of American efforts to "smooth the wrinkled front of grim-visaged war" for them. The hospital was established by American subscriptions in the early days of the war and has been a boon to the sick and wounded that cannot be measured in words.

There will be no overhead expense in the handling of the National Geographic Society's fund, and every dollar will be expended for equipment and maintenance of the ward.

The need is inevitable; therefore subscribe now, because it takes considerable time to secure and transmit equipment to the hospital. No matter how small or how large your subscription, it will be welcome and proper acknowledgment made.

(CUT HERE)

GILBERT H. GROSVENOR,

Chairman, National Geographic Society Ward Fund,

16th and M Streets N. W., Washington, D. C.

I enclose $..... toward the National Geographic Society Ward of the American Ambulance Hospital, Neuilly, France, *thus indicating my belief in preparedness.*

(Name).....

(Address).....

What a pity she doesn't know

Resinol Soap

would clear her skin

"She would be a pretty girl if it wasn't for her miserable complexion!" But the *regular* use of Resinol Soap, aided at first by a little Resinol Ointment, would probably make it clear, fresh and charming. If a poor skin is *your* handicap, begin using Resinol Soap and see how quickly it improves.

But the use of Resinol Soap is by no means confined to the improvement of poor complexions. It is a delightfully pure, cleansing and softening soap, which truly merits its place among the finest toilet requisites. At the same time, it contains just enough of the gentle Resinol medication to *preserve* the delicate texture and color of a *healthy* skin from the inroads of sun, wind, dust and *time*.

This same purity, and soothing, healing medication also adapt Resinol Soap to the care of the hair, and of a baby's tender, easily irritated skin.

Resinol Soap is not artificially colored, its rich brown being entirely due to Resinol medication, which *doctors prescribe* so widely in their treatment of skin and scalp affections.

Resinol Soap is sold by all druggists and most dealers in toilet goods throughout the United States and Canada.

Use This Chest FREE

Moth-Proof Cedar Chest Sent on Free Trial

A famous Piedmont Red Cedar Chest. Your choice of 90 styles and designs sent on 15 days' free trial. We pay the freight. A Piedmont protects furs, woolens, and plumes from moths, mice, dust, and damp. Distinctly beautiful. Needed in every home. Lasts for generations. Finest Christmas, wedding, or birthday gift at great saving. *Write today for our great new catalogue and reduced prices—all postpaid free.*

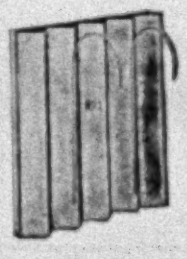
Reduced Factory Prices. Freight Prepaid

Piedmont Red Cedar Chest Co., Dept. 69, Statesville, N. C.

SAVO AIR MOISTENER

Fill with water, hang on back of any radiator out of sight

Converts dry indoor air into a moist, wholesome, healthful atmosphere.



IT WILL SAVE

Your Health.
Furniture from shrinking.
Piano from warping.
Paintings from cracking.
Wall Paper from peeling.
Book Bindings breaking.
House Plants from dying.
Whole family from colds.

MOST EFFICIENT HUMIDIFIER MADE
Write for Free Booklet.

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DENBY MOTOR TRUCKS

No strain of service can find a weak point in Denby construction; for there are no "minor" parts. Every part has the same great factor of super-strength for its purpose.

Denby Motor Truck Company

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It is a fascinating book, filled with illustrations—many in actual colors—of the quaint and curious objects of art and utility collected by the Vantine representatives in Japan, China, Persia, and other Oriental countries.

As a reader of the *National Geographic Magazine* we feel sure you will be interested, for the Vantine Catalog "increases and diffuses geographic knowledge" by illustrating or describing the distinctive and individual creations of the artisans in the mystical lands beyond the seas.

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in packages—the cleanest form of packing obtainable

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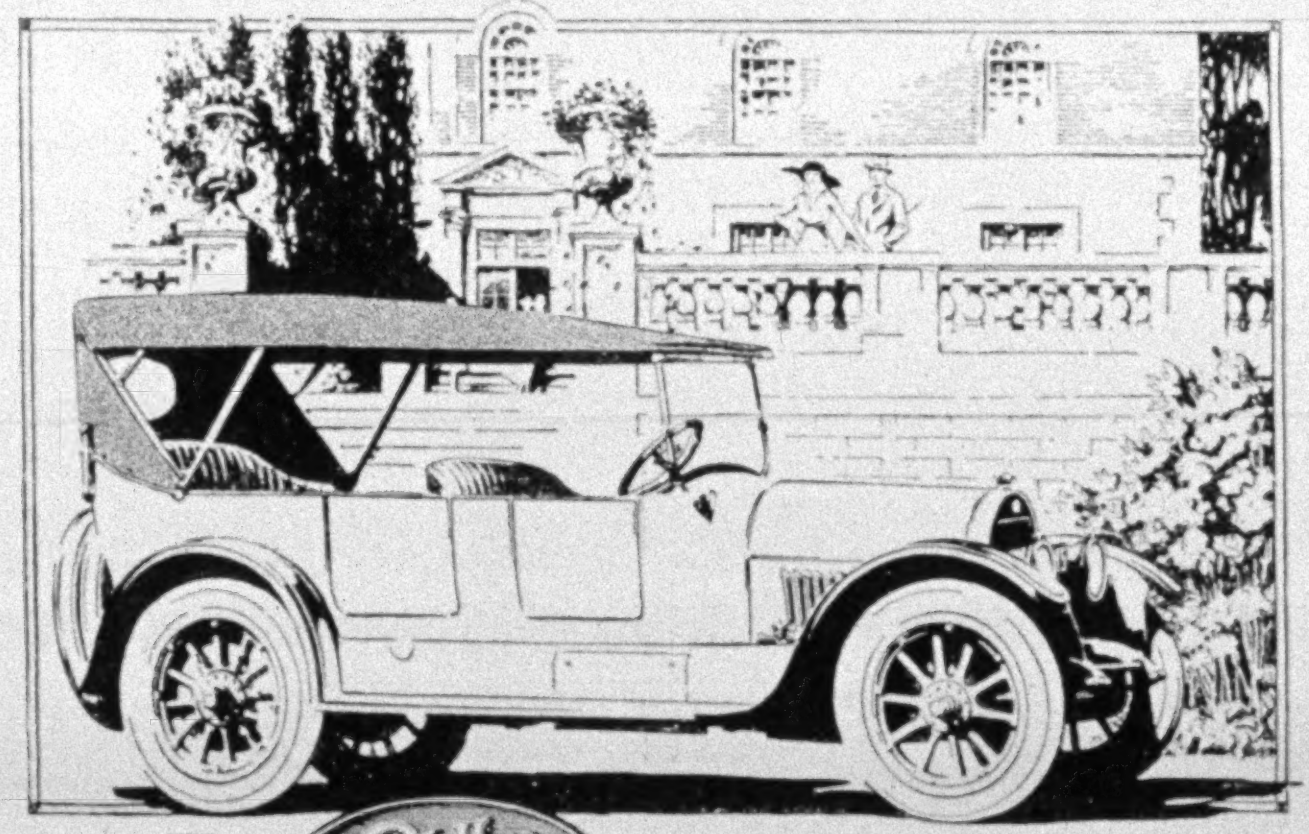
The Pro-phy-lac-tic is the ONE Tooth Brush in universal use today—everywhere



The Cadillac Standard of the World Adhering firmly to the policy of "Nothing good enough but the best," is equipped with a top made of

Genuine

Pantasote

the most expensive and the most serviceable

Top Material

The makers of the Cadillac and other cars mentioned below can truthfully state that they buy the most expensive top material in order to give the car owner the best, regardless of cost.

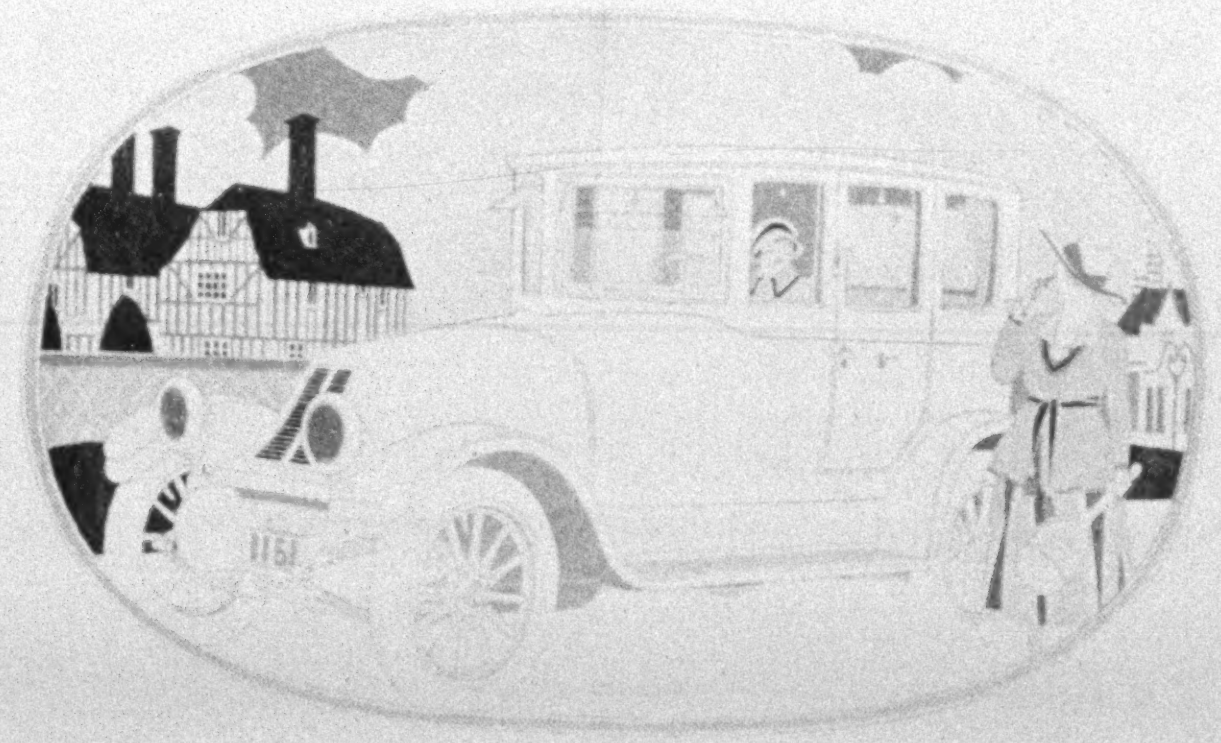
CARS using Pantasote Standard Equipment

Pierce-Arrow		Cadillac
Locomobile	Hudson	Reo-Six
Marmon	Chalmers	Columbia
White	Chandler	Cole
Mercer	Premier	Westcott

Avoid misrepresentation, even though it be unintentional. Look for this label on tops represented as Pantasote.

PANTASOTE COMPANY

Room 1714, Bowling Green Building, New York City



WHY BUYERS OF ENCLOSED CARS NOW PREFER THE FRANKLIN

THESE are days when everyone wishes to be more self-reliant – when the young men of the family or the help on the place, are at the Government call for War or for Industry. It is the greatest of times for a self-contained car that any member of the family can drive and use.

Most people think of an Enclosed Car as something formidable—heavy, hard to handle, complicated, expensive, and requiring a mechanician—too much car for these self-reliant times. And this has been so, concerning the cars they knew.

It was the Franklin that put the new type of Enclosed Car on the map and inaugurated—because it made it possible—the Vogue of the Enclosed Car for all uses.

The Franklin Enclosed Car is light, flexible, resilient, easy-rolling—with the economies and advantages of the Franklin Open Models.

It can be driven as freely over all roads and in all weathers, and is so easy to handle that it can be driven all day without fatigue.

Of all the fine enclosed cars, the Franklin is the most resilient, the most responsive, the easiest on tires.

Franklin owners' personal reports, over a five-year period, give the Franklin an average of 10,203 miles to the set of tires.

Franklin's gasoline economy is a factor of the greatest importance. On July 13th, this year, 179 Franklin Open Cars in all parts of the United States averaged the remarkable mileage of 40.3 miles to the single gallon of gasoline.

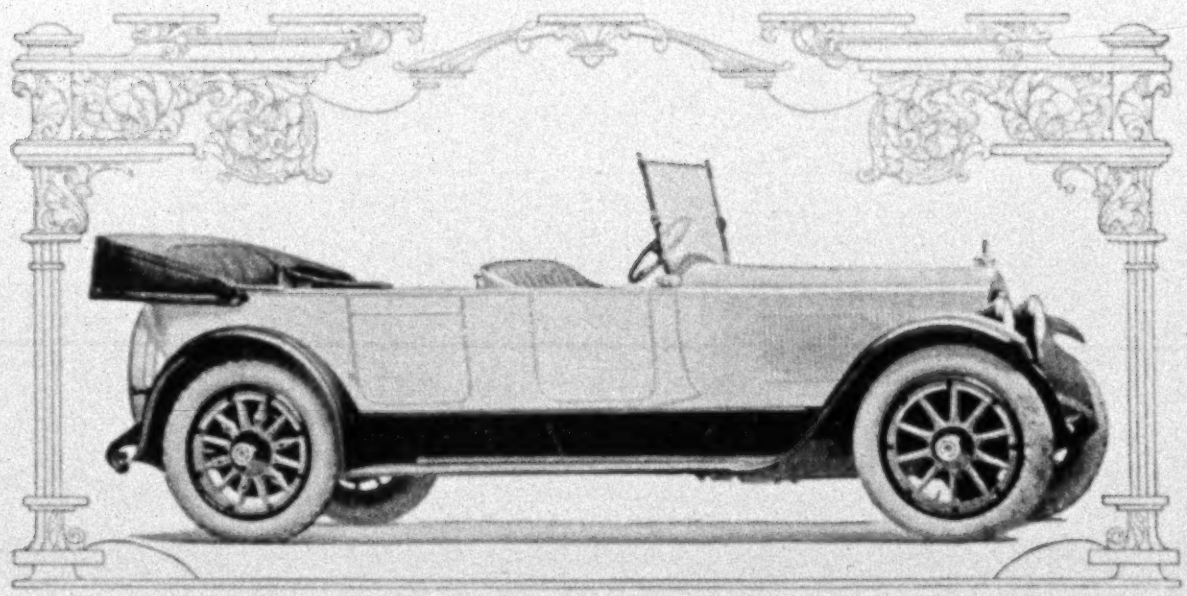
It is a fact that the Franklin Enclosed Cars show within a few percent the same gasoline mileage and tire mileage as the Franklin Open Models.

Real saving today is in the upkeep of a car, and your Franklin dealer can give you facts and figures, the actual Thrift records of Franklin owners everywhere – the most cheerful and encouraging news to any one about to buy a car.

Sedan	2610 lbs.	$2950.00	Cabriolet	2485 lbs.	$2850.00	Brougham	2575 lbs.	$2900.00
Town Car	2610 lbs.	3200.00	Limousine	2620 lbs.	3200.00	All Prices F. O. B. Syracuse		

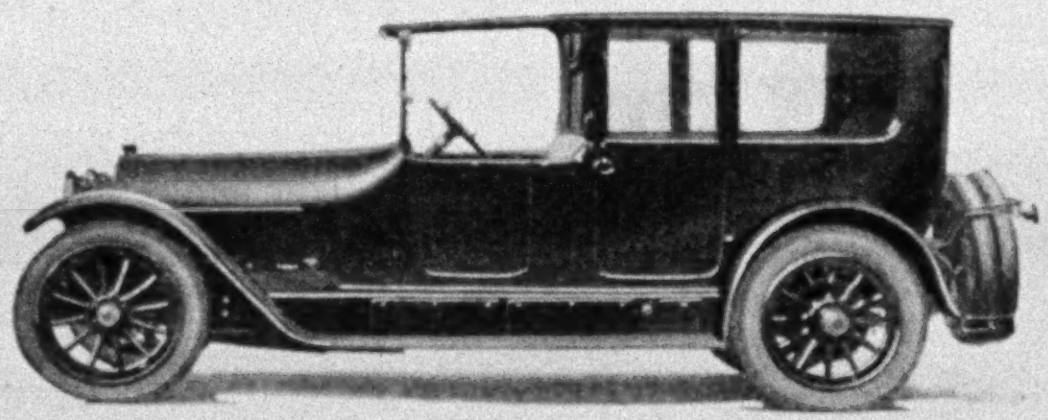
FRANKLIN AUTOMOBILE COMPANY

SYRACUSE, N. Y., U. S. A.



A new creation! A more beautiful Packard is here announced. Now—a remarkable accomplishment in *body designing* matches the achievement of the epoch-making Twin-six motor. And thereby is rounded out the smartest and *most efficient* motor car we have ever built. Branches and dealers today have ready for your inspection new models—3-25 and 3-35. Open car prices are $3450 and $3850 at Detroit.

LOCOMOBILE



A "Series Two" Closed Car

LIMOUSINES AND LANDAULETS

Conventional Coach Work Designs of Continental origin which are as perennial in style and good taste as the Orders of Architecture, as enduring in artistic usefulness as a grand piano or period furniture. Built in limited quantities for those who prefer a conservative model, fully developed and perfected.

THE LOCOMOBILE COMPANY OF AMERICA

MAKERS OF FINE MOTOR CARS

PRE NVMERO
EXCELLENTIA

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Williams'

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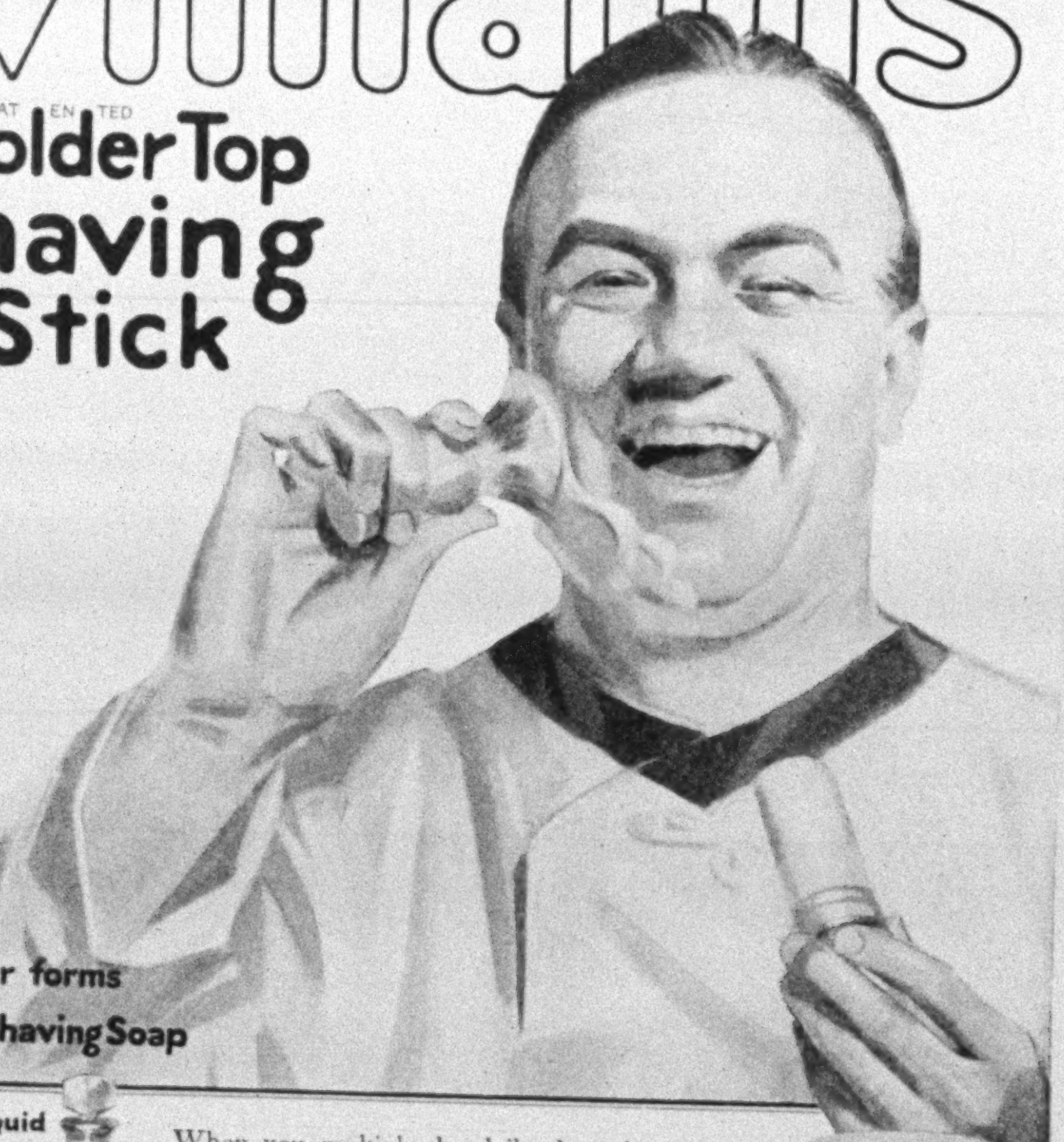
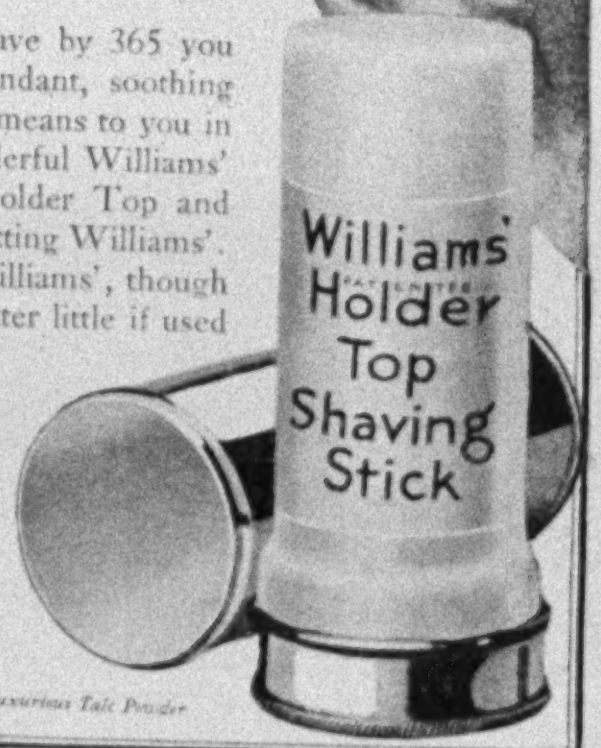
Holder Top Shaving Stick



Three other forms of Williams' Shaving Soap

When you multiply the daily shave by 365 you realize what the rich, moist, abundant, soothing lather of Williams' Shaving Soap means to you in a year's time. Add to this wonderful Williams' lather the convenience of the Holder Top and you increase the importance of getting Williams'. Anything below the standard of Williams', though it be but a *shade* below, might matter little if used once or twice, but the shave is the daily duty of a lifetime. Ask for it by its full name—Williams' Holder Top Shaving Stick.

Send 12c in stamps for a trial size of the Stick, Cream, Powder or Liquid. Then decide which you prefer or send 4c in stamps for any one.

The J. B. Williams Co.
Dept. A, Glastonbury, Conn.

Add the finishing touch to your shave with Williams' luxurious Talc Powder